



Final Report
RapidGasSM and Long-Term
Sample Analysis

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Section 24, T21N, R40W
Grant County, Nebraska

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TABLE OF CONTENTS

	<i>Page</i>
1.0 INTRODUCTION	2
2.0 DATA AND ANALYSIS DETAILS	4
2.1. OPERATIONAL SUMMARY	4
2.2. RAPIDGAS SM ANALYSIS PROCEDURE	5
2.3. GAS CONTENT ESTIMATES	6
2.4. GAS DIFFUSIVITY AND SORPTION TIME	6
2.5. CORE LITHOLOGY & PHOTOGRAPHY	7
2.6. TOTAL ORGANIC CARBON (TOC) AND GRAIN DENSITY	7
2.7. ROCK EVAL PYROLYSIS	8
2.8. ROUTINE CORE ANALYSIS	12
3.0 SORBED GAS-IN-PLACE ESTIMATES	12
4.0 GLOSSARY	18
5.0 REFERENCES	21

LIST OF TABLES

Table 1-1. RapidGas SM Reservoir Property Estimates.....	3
Table 3-1. Sorbed GIP Volume Estimates.....	14
Table 3-2. Sorbed GIP Volume Estimates - <i>Continued</i>	15
Table 3-3. Sorbed GIP Volume Estimates - <i>Continued</i>	15

LIST OF FIGURES

Figure 2-1 Reciprocal Helium Density versus TOC Content.....	7
Figure 2-2 Air-dry Gas Content versus TOC Content	8
Figure 2-3 Kerogen Type.....	9
Figure 2-4 Kerogen Conversion and Maturity	11
Figure 2-5 TOC versus Remaining Hydrocarbon Potential Diagram	12

DATA SUMMARY

Desorption Sample Identification and Description	1
Desorption Sample Special Testing	2
Mass and Volume Data	3
Desorption Sample Moisture, Ash, and Sulfur	4
Desorption Sample Density	5
Desorption Total organic Carbon	6
Crushed Gas Analysis Summary	7
Desorption & Gas Content Summary	8
Gas Sorption & Diffusion Characteristics	9

LIST OF APPENDICES

Appendix I	Lithological Description and Digital Photography
Appendix II	Desorption Graphs
Appendix III	Grain Density Data
Appendix IV	Total Organic Carbon and Rock Eval (Humble)
Appendix V	Residual Moisture, Ash, & Total Sulfur Data
Appendix VI	Sorbed Gas Composition

1.0 INTRODUCTION

This report summarizes procedures and results of **RapidGas**SM analysis conducted on selected core samples recovered from the Sharon Springs and Niobrara Members at Ansbro Petroleum Company, L.L.C.'s (Ansbro) Lowe ranch 41-24 (Lowe Ranch) well. Lowe Ranch is located Section 24, Township 21N, Range 40W in Grant County, Nebraska.

The major goal of this project was to provide preliminary desorbed gas content, gas composition, and desorbed gas-in-place volume estimates for the Sharon Springs and Niobrara Members at the Lowe Ranch well based on **RapidGas**SM analysis data. This report provides the following:

1. Background Information
2. Data and Analysis Details Section
3. Sorbed Gas-In-Place Volume Section
4. Data Summary Section
5. Appendices

TICORA's **RapidGas**SM analysis procedure provides a proven means to rapidly gather and report reservoir property estimates including: sorbed gas content, sorbed gas composition, sorbed gas-in-place volume estimates, and bulk sample composition for selected core samples recovered from coal and shale gas reservoirs.

At the request of Mr. Dan Bean (Geologist, Ansbro) **RapidGas**SM analysis was conducted on four core samples of the total eight core samples recovered from the Lowe Ranch well. Table 1-1 summarizes reservoir property data for these **RapidGas**SM samples.

The following information was determined from the **RapidGas**SM analysis for each of the selected samples:

1. Total sorbed gas content
2. Gas sorption time and diffusivity
3. Sample bulk composition (Grain density, total organic carbon, residual moisture, ash, and total sulfur content)

Sorbed gas-in-place volume was also determined from the **RapidGas**SM analysis and geophysical log data. The total desorbed gas volume estimates include the volume of gas lost while retrieving the samples, volume of gas measured during short-term desorption tests, and remaining gas volume measured by crushing samples subsequent to short-term desorption tests. Total gas volume was divided by air-dry sample weight to determine air-dry total gas content. In addition to air-dry basis total gas content data, an estimate of total gas content data on a dry, ash-free basis are included in Table 1-1. Conversion of air-dry basis gas content to a dry, ash-free basis allows comparison of organic material gas content without dilution by inorganic material.

At the time of writing no in-situ (inherent) moisture data were available. Therefore, reservoir property data cannot be converted to an in-situ basis and sorbed gas content and gas-in-place volume estimates may be over or underestimated. Whether reservoir property data are over or underestimated is dependent upon whether in-situ moisture values are greater or less than residual (air-dry) moisture values.

Table 1-1. RapidGasSM Reservoir Property Estimates

TICORA Sample Number		322-1	322-3	322-6	322-8
Member		Sharon Springs		Transition Zone	Niobrara
Depth Top (driller's depth)	feet	2,110.3	2,117.6	2,137.4	2,185.0
Depth Base (driller's depth)	feet	2,111.3	2,118.6	2,138.4	2,186.0
Reservoir Properties					
Reservoir Temperature*	°F	85	85	85	85
Bulk Properties					
Desorption Temperature	°F	85	85	85	85
Total Sorbed Gas Content (DAF Basis)	scf/ton	82.10	66.90	16.92	36.48
Total Gas Content (Air-dry Basis)	scf/ton	17.90	15.57	5.25	10.03
Gas Sorption Time	hours	418.14	584.40	2.44	79.94
Gas Diffusivity	sec ⁻¹	4.43(10 ⁸)	3.17(10 ⁸)	7.58(10 ⁶)	2.32(10 ⁷)
Grain Density (Air-dry Basis)	g/cm ³	2.122	2.145	2.168	2.211
Ash Content (Air-dry Basis)	wt. %	74.54	73.45	66.78	70.01
Residual Moisture Content	wt. %	3.66	3.27	2.19	2.49
Total Sulfur Content (Air-dry Basis)	wt. %	7.31	10.65	2.39	6.50
Total Organic Carbon (TOC)	wt. %	11.98	12.03	5.01	6.45
Rock Eval Parameters, S1	mg/g	1.60	1.81	N/D	N/D
Rock Eval Parameters, S2	mg/g	60.49	56.85	N/D	N/D
Rock Eval Parameters, S3	mg/g	3.03	3.50	N/D	N/D
Hydrogen Index, S2 x 100/TOC	mg/g	505	473	N/D	N/D
Oxygen Index, S3 x 100/TOC	mg/g	25	29	N/D	N/D
Production Index, S1 / (S1+ S2)	mg/g	0.03	0.03	N/D	N/D
Calculated Vitrinite Reflectance	Ro	0.31	0.31	N/D	N/D
Tmax	°C	415	415	N/D	N/D

Notes:

* Reservoir temperature based on temperature data supplied by Dan Bean.

2.0 DATA AND ANALYSIS DETAILS

This section summarizes the operational procedures and analysis methods used to determine the data listed in. A summary and discussion of the analysis results are also presented in this section.

2.1. OPERATIONAL SUMMARY

A total of eight approximately one-foot in length (3.00-inch diameter) core samples were collected from the Sharon Springs and Niobrara Members from cored intervals (Refer to Table 1-1) on 11 March, 2004. Four of the total eight core samples were selected for **RapidGas**SM analysis. The core samples were sealed in desorption canisters and equilibrated to approximate reservoir temperature for sorbed gas content and composition analysis. Silica beads pre-heated to approximate reservoir temperature was used to fill the space between the plastic sleeve and the canister wall to minimize headspace volume and therefore increase accuracy of desorption measurements and maximize quality of gas samples collected for compositional analysis. Desorbed gas volume measurements were collected once the canisters had equilibrated to approximate reservoir temperature.

On 24 February 2004, Dan Bean (Ansbro) provided TICORA temperature information for the Lowe Ranch well. This temperature data was used to calculate approximate reservoir temperatures (Refer to Table 1-1). Approximate reservoir temperatures were used for short-term desorbed gas content and crushed gas content analyses.

No pressure information was made available to TICORA at the time this report was written, so a standard 0.433 psi/ft pressure gradient was assumed. This pressure gradient has an insignificant effect on lost gas calculations. However, it will significantly effect the interpretation of adsorption isotherm data subsequent to analysis. Adsorption isotherm data will be reported in the Final Report.

Schlumberger recorded geophysical logs (resolution = 0.5 feet) (including caliper, gamma-ray, and bulk density) at the Lowe Ranch well on 14 March, 2004.

2.2. **RAPIDGAS**SM ANALYSIS PROCEDURE

The **RapidGas**SM analysis procedure follows best practice analysis protocols developed by TICORA, ASTM, and the Gas Technology Institute (GTI).^{1,2,3,4,5,6} **RapidGas**SM analysis provides a proven means to rapidly gather and report reservoir property estimates including sorbed gas content, sorbed gas-in-place volume estimates, and sample composition within weeks of coring. Conventional analysis programs typically require greater time to complete (i.e. up to several months).

However, **RapidGas**SM analysis alone does not address all the data needed to comprehensively evaluate critical reservoir properties. In particular, reservoir properties not addressed include gas storage capacity determined from adsorption isotherm analysis and natural fracture permeability determined by well test or production analysis. Sorption isotherm data are required to determine gas storage capacity as a function of increasing pressure at reservoir temperature. Adsorption isotherm analysis allows prediction of gas-in-place volume that can be produced by reservoir pressure depletion, together with, initial gas saturation (i.e. ratio of gas content to gas storage capacity), critical desorption pressure (i.e. pressure at which production of gas commences), and gas abandoned in-place (i.e. gas volume left in-place after production). Well testing is required to characterize natural fracture system properties within a reservoir. These data are required for commercial gas productivity estimates. The natural fracture system properties required include reservoir pressure, effective permeability to gas and water, absolute permeability, and degree of near well alteration caused by drilling and completion procedures.

Short-term desorption tests on core samples selected for **RapidGas**SM analysis were conducted at constant approximate reservoir temperature. Desorbed gas volumes were measured to the nearest 1.0-milliliter by fluid displacement. The frequency of measurements was greatest during the early phase of desorption testing to ensure sufficient data were available for precise lost gas volume determination. Short-term desorption tests were terminated within approximately nineteen to twenty days of the coring operations. The gas desorption data were used to calculate the lost gas volume using a variation of the U.S. Bureau of Mines Method.¹

At the conclusion of the short-term desorption tests the core samples were removed from the canisters, digitally photographed, and described lithologically. The lithological descriptions and digital photographs are provided in Appendix I. Subsequent to lithological description and digital core photography, sample particle size was quickly reduced to a one-inch diameter top size. Three approximately equal weight representative splits were then quickly removed from the gross sample. The volume of each split was calculated using measured sample weight and grain density. The remaining sorbed phase gas volume was determined by measuring the amount of gas released after pulverizing the triplicate splits.

The triplicate splits were individually pulverized in specialized sealed crushing vessels, under an inert gas (helium) atmosphere. Desorbed (crushed) gas volume was measured at approximate reservoir temperature. The desorbed (crushed) gas volume was measured periodically until no measurable gas was observed from the crushing vessel. The crushed gas volume of the **RapidGas**SM samples was calculated by averaging crushed gas volumes obtained for the triplicate splits. The **RapidGas**SM air-dry gas content estimates were obtained by dividing the sum of the calculated lost gas, desorbed gas, and average crushed gas volumes by the air-dried core sample weights.

ASTM methods were used to determine residual moisture (ASTM Method D 5142), ash (ASTM Method D 5142), and total sulfur contents (ASTM Method D 4239C) of triplicate air-dried splits of the gross core samples. The grain density was measured in triplicate using helium pycnometry on the pulverized air-dried sample splits. The density of the **RapidGas**SM samples was calculated by averaging the density values obtained for the triplicate splits.

2.3. GAS CONTENT ESTIMATES

Total gas volume was determined by summing calculated lost gas volume, measured desorbed gas volume, and measured crushed gas volumes. Total gas volume was divided by air-dry sample weight to determine air-dry total gas content. Page 9 of the Data Summary Section summarizes gas content estimates (air-dry and dry, ash-free bases) for the **RapidGas**SM samples and presents an average and standard deviation of these data. Desorption graphs presented in Appendix II illustrate the magnitude of lost (labeled red), measured (labeled green), and crushed gas (labeled blue) components for each sample. The reported air-dry gas contents may be an over or underestimation of in-situ gas contents (Refer to Section 1.0).

2.4. GAS DIFFUSIVITY AND SORPTION TIME

Gas storage and flow through coal seams and shale are generally modeled with dual porosity reservoir models. Gas is stored by sorption within the primary porosity system within the organic component of coal or shale matrix. The primary porosity consists of micro- (<2 nanometers) and meso-porosity (2 to 50 nanometers). Gas flows to the well bore through the secondary porosity system, which consists of macro-pores (>50 nanometers) and natural fractures. Gas flow through the primary porosity is dominated by diffusion and quantified with Fick's Law while that through the secondary porosity is quantified with Darcy's Law.⁷

Diffusivity is the diffusion coefficient (D) divided by the square of an average diffusion distance (r^2). Diffusivity can be estimated from the method used for determining lost gas volume using the relationship listed in Equation 2.1.

$$\frac{D}{r^2} = \left(\frac{m}{203.1G_{cad}} \right)^2 \quad [2.1]$$

where:

D/r^2 diffusivity, sec^{-1}

m slope of desorbed gas content versus square-root time graph, $\text{scf/ton-hour}^{0.5}$

G_{cad} air-dry total gas content, scf/ton

Although diffusivity values are used in reservoir models, an easier concept to understand is the sorption time. Sorption time is defined as the time required to desorb 63.2% of the original gas content if a sample is maintained at constant reservoir temperature. The relationship used to relate sorption time to diffusivity is listed in Equation 2.2.

$$\tau = \frac{1}{3600\alpha \frac{D}{r^2}} \quad [2.2]$$

where:

τ sorption time, hours

D/r^2 diffusivity, sec^{-1}

α geometrical shape factor, cm^2

The geometrical shape factor for a sphere, the most common assumed geometry is 15.

Table 1-1 summarizes diffusivity and sorption time estimates for the **RapidGas**SM samples. Page 10 of the Data Summary Section also summarizes diffusivity and sorption time values for the **RapidGas**SM samples and presents an average and standard deviation of these data.

2.5. CORE LITHOLOGY & PHOTOGRAPHY

Digital core photographs and a description of core lithology for the **RapidGas**SM samples are presented in Appendix I. **RapidGas**SM samples were competent to semi-competent (Refer to Appendix I).

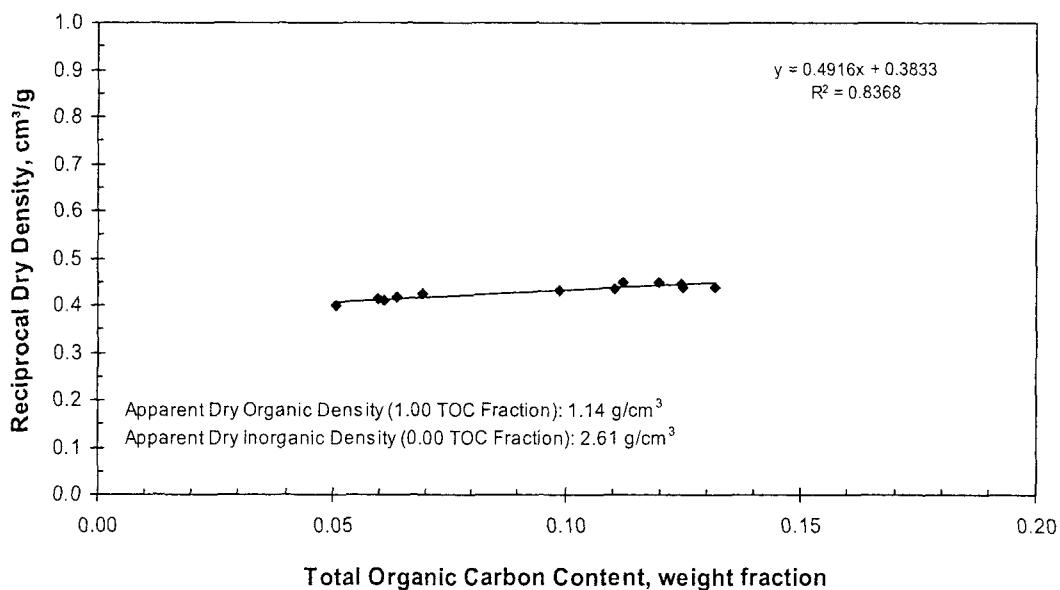
2.6. TOTAL ORGANIC CARBON (TOC) AND GRAIN DENSITY

The samples were initially dried and crushed. Subsequent treatment with hydrochloric acid effectively removed the carbonate portion of the material. The organic carbon component was measured through combustion (1,300°C) in a furnace while measuring the amount of evolved carbon dioxide using an IR detector.

TOC analysis is a comparatively quick and inexpensive procedure that is typically used to effectively screen potential source rock samples. TOC is a measure of the richness of a rock with respect to weight percent organic carbon. True shales can be extremely rich in organic carbon (~10%), but a minimum value for which rocks can be officially deemed source rocks is not always definable, as thermal history, specific variety of organic material, and efficiency of hydrocarbon migration all play a significant role in source rock potential. In general, shales containing less than 0.50 weight percent TOC and carbonates possessing less than 0.20 percent are not regarded as particularly good source rocks. However, when sufficient thickness and natural fracture permeability are present, low organic content shales can serve as productive shale gas reservoirs.

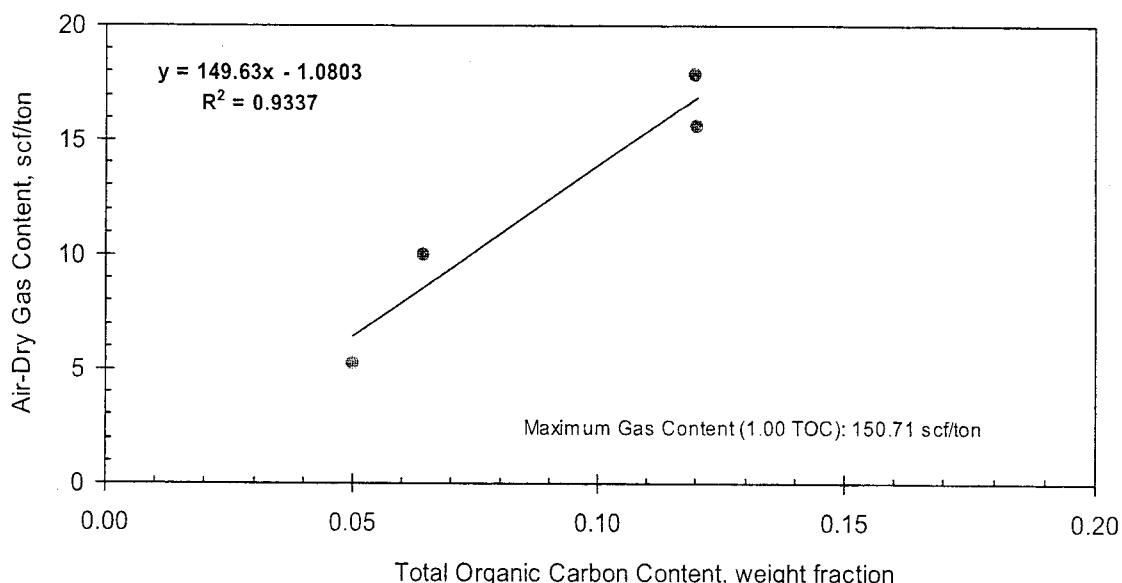
Humble Geochemical Services (Humble) performed total organic carbon (TOC) analysis of selected samples 322-1, 322-3, 322-6, and 322-8 using the Leco method. The Humble report is included as Appendix II. The density of shale varies as a function of its bulk composition. Since the mineral matter component of the shale has a significantly higher density than the organic matter component, the bulk density of shale varies directly as a function of its mineral matter content. Therefore a good relationship can be established between reciprocal dry densities versus dry total organic carbon. Additional, Toc and grain density testing was conducted on the core. Figure 2-2 illustrates this well. Table 1-1 summarizes all desorption TOC and grain density results.

Figure 2-1 Reciprocal Helium Density versus TOC Content



In some reservoirs a statistically significant relationship exists between the gas content of each sample and the organic content. Figure 2-3 illustrates excellent correlations between gas content and organic content for the Sharon Springs and Niobrara Member's samples collected at the Lowe Ranch wells. The extrapolated gas content at 100% organic content, regression coefficient (R^2), and slope of the relationship is illustrated in Figure 2-3.

Figure 2-2 Air-dry Gas Content versus TOC Content



2.7. ROCK EVAL PYROLYSIS

Rock Eval pyrolysis is a more advanced geochemical characterization than the TOC procedure. The measurements are based upon heating small samples over the temperature range of 300 to 550 °C. Four specific parameters are obtained from the analysis as follows:

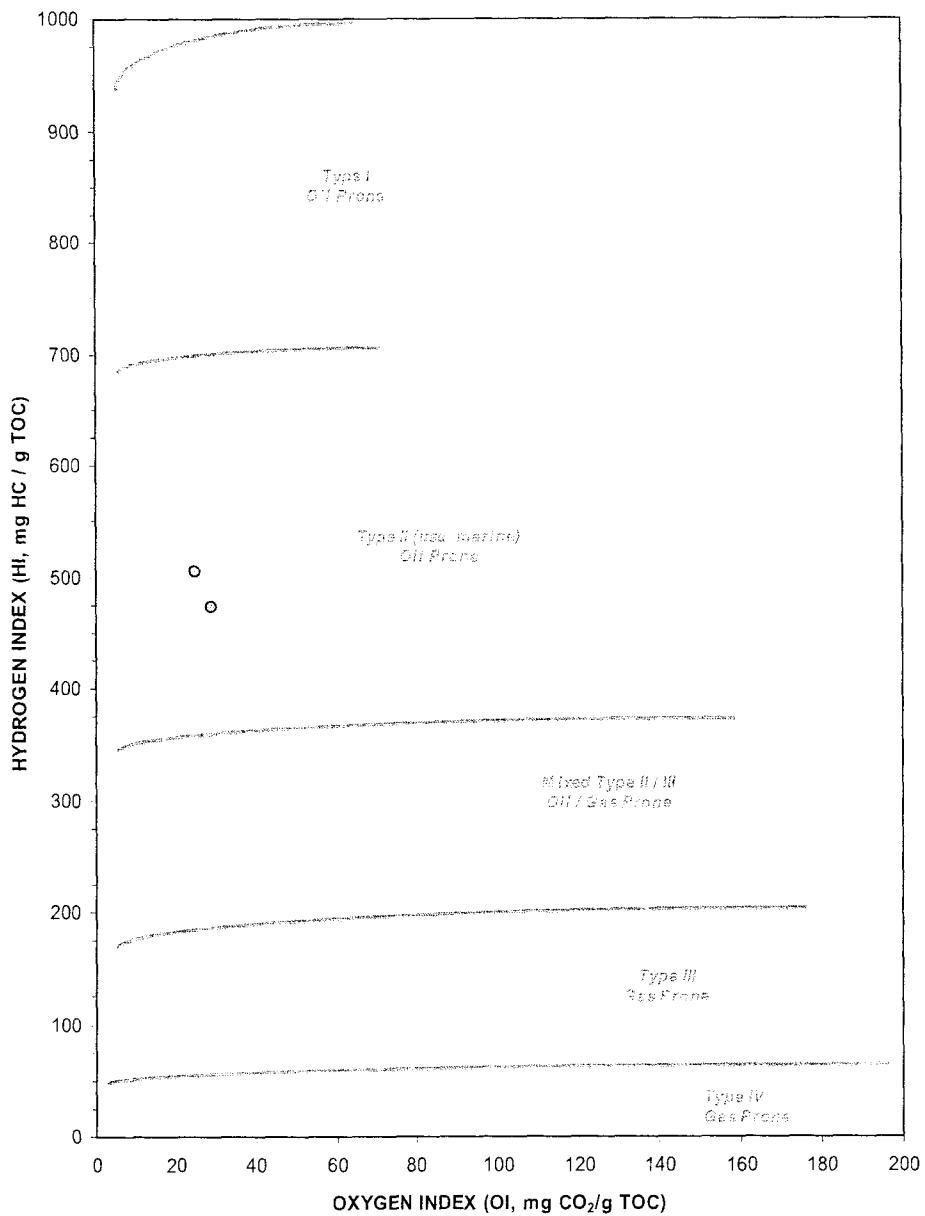
1. S1 represents free hydrocarbons in the source rock, volatilized at 300 °C.
2. S2 is an estimate of the hydrocarbons generated in the subsurface under native-state conditions and is influenced by the amount of hydrocarbons produced by the thermal cracking of kerogen types.
3. S3 represents the amount of carbon dioxide produced from organic sources. The carbon dioxide is collected over a specific temperature range (300 to 390°C) such that contributions from inorganic carbonates are avoided. Inorganic sources of carbon dioxide are commonly generated at higher temperatures.
4. Tmax represents the temperature at which hydrocarbon generation occurs at its maximum rate during pyrolysis. Thermocouples are used to monitor this important event.

Third-party commercial laboratory Humble Geochemical Services conducted the TOC and Rock Eval testing.

Humble performed Rock Eval pyrolysis (including TOC and calculated vitrinite reflectance analyses) on samples 322-1 and 322-3. The Humble report is included as Appendix II. Kerogen (organic matter) type can be characterized by two indices: (1) the hydrogen index ($S_2 \times 100/TOC$) and (2) the oxygen index

(S3 x 100/TOC). When plotted against one another, a plot similar to the Van Krevelen diagram for elemental kerogen analysis (modified by Waples for this purpose) is obtained as illustrated in Figure 2-4. Samples that follow the line indicated for Type I kerogen are mainly aliphatic in nature, are derived from algal lipids, and can have very high oil or gas generating potential. Type II kerogen is predominately of a naphthenic nature and is usually formed from marine organic matter (plankton) in a reducing environment. The oil generating potential of type II kerogen is high although lower than for Type I. Type III kerogen is mainly aromatic in nature and is formed from terrestrial higher plants. This type of kerogen is similar to humic coals. The oil generating potential is low and dry gas is generated primarily from Type III kerogen. Samples 322-1 and 322-3 are dominated by Type II kerogen (Refer to Figure 2-4).

Figure 2-3 Kerogen Type



Adding the S1 and S2 parameters (S1+S2) and expressing this value in terms of kg/ton of rock can also yield a useful parameter for the evaluation of source rock potential. The evaluation guidelines are as follows:

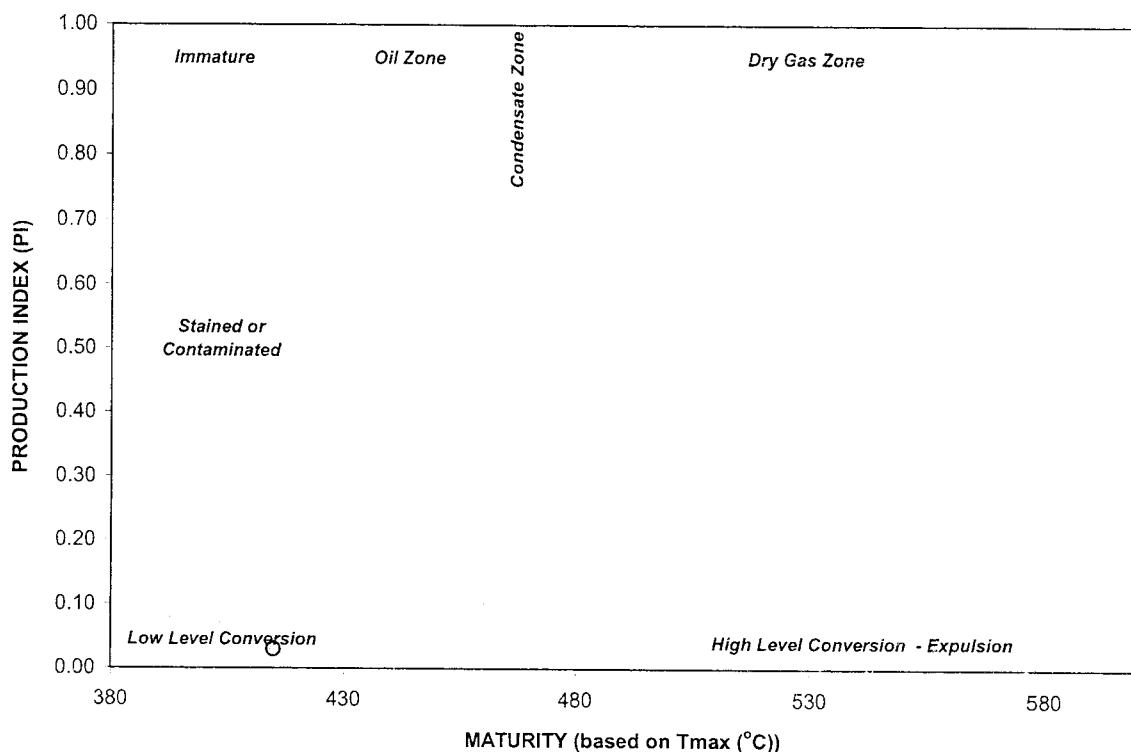
- Higher than 6 kg/ton: good source rock for oil;
- Between 2 and 6 kg/ton; moderate source potential for oil;
- Less than 2 kg/ton; and poor for oil, some potential for gas.

The calculated S1+S2 values for samples 322-1 and 322-3 indicate the potential to produce gas.

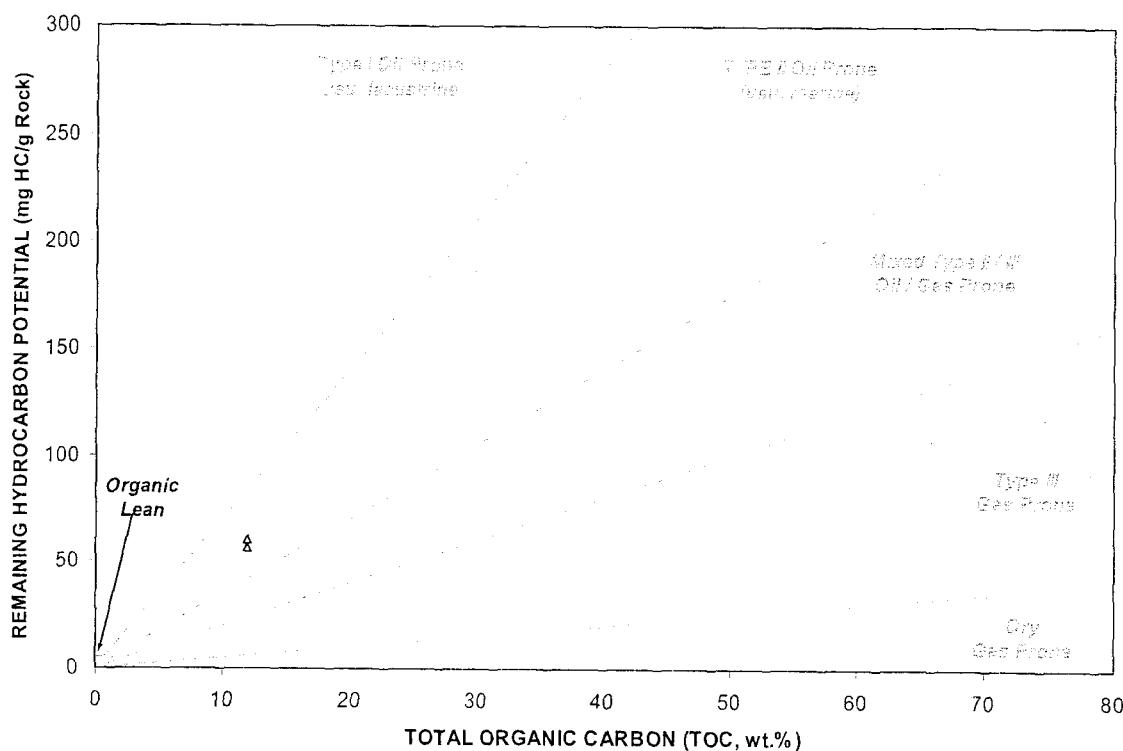
Thermal maturation can be examined using Tmax, which typically increases with depth. Although values commonly vary from laboratory to laboratory, the following subdivision is normally followed: temperatures between 400 and 430°C correspond to the immature zone; temperatures between 430 and 470°C define the major interval of oil production; and temperatures above 470 °C represents the interval where gas rather than oil is generated. The Tmax values for samples 322-1 and 322-3 are 415°C and 415°C, respectively, indicating that they fall within the immature zone. The Production Index (PI) S1/(S1+S2) can also be used to evaluate source rock potential. PI is indicative of the conversion of kerogen into free hydrocarbons. The evaluation guidelines are as follows:

- 0.00 to 0.08: immature;
- 0.08 to 0.50: Oil Window;
- > 0.50: Gas Window.

The PI for sample 322-1 and 322-3 are 0.03 and 0.03, respectively, indicating that the source rock is immature. Source rock potential can be further characterized using a plot of Tmax versus PI. Figure 2-5 illustrates that samples 322-1 and 322-3 fall in the low level conversion window, indicating a low level of kerogen to free hydrocarbon conversion.

Figure 2-4 Kerogen Conversion and Maturity

TOC values, determined by the Leco method, these core samples ranged from 5.01 to 11.98 weight percent. Another relationship exists that is useful in the evaluation of the hydrocarbon generation potential of shales. The relationship of TOC plotted against the value for Remaining Hydrocarbon Potential indicates the propensity for generation of oil or gas in a given sample. In this instance, the plot indicates the presence of Type II kerogen suggesting that oil may be produced within the samples interval. Figure 2-6 illustrates these results.

Figure 2-5 TOC versus Remaining Hydrocarbon Potential Diagram

2.8. ROUTINE CORE ANALYSIS

Ms. Margot Timbel (Ansbro) requested that routine core analysis be conducted on eight core samples. The results from TerraTek are summarized in the Appendix IV.

3.0 SORBED GAS-IN-PLACE ESTIMATES

Sorbed gas-in-place (GIP) analysis was performed on a gross reservoir interval including the Sharon Springs and Niobrara Members using analysis data and by processing high-resolution open-hole density log data. Schlumberger recorded geophysical logs (resolution = 0.5 feet) (including caliper, gamma-ray, and bulk density) at the Lowe Ranch on 14 March, 2004. GIP resource estimates for homogeneous coal gas reservoirs are best obtained using Equation 3.1.

$$G = 1,359.7 Ah\rho G_c \quad [3.1]$$

where:

G = gas-in-place volume, scf

A = reservoir area, acres

h = reservoir thickness, feet

ρ = average in-situ rock density at the average in-situ rock composition, g/cm³

G_c = average in-situ gas content at the average in-situ rock composition, scf/ton

The 1,359.7 factored in Equation 3.1 is the ratio between the number of square feet in one acre (43,560 feet) and the conversion factor to get from cubic centimeters per gram (cm^3/g) to cubic feet per ton (ft^3/ton) (32.0368).

The drainage area was assumed to be 160 acres. The reservoir interval was selected using bulk density geophysical logs. Ansbro provided TICORA with the geophysical log in LAS format for interpretation. The reported GIP volume estimates are based on air-dry gas content estimates. Since a good relationship exists between bulk density (log) and air-dry gas content (Figure 3-1) and between air-dry gas content with TOC (Figure 2-2). This equation from the relationship established in Figure 3-1 was used to calculate the air-dry gas content estimate for the Sharon Springs and Niobrara Members. These gas content estimates and the bulk density (log) were substituted into equation 5.1 to calculate GIP. The GIP volume estimates for the gross reservoir interval are summarized in Table 3-1.

Figure 3-1 Bulk Density (log) versus Air-dry Gas Content

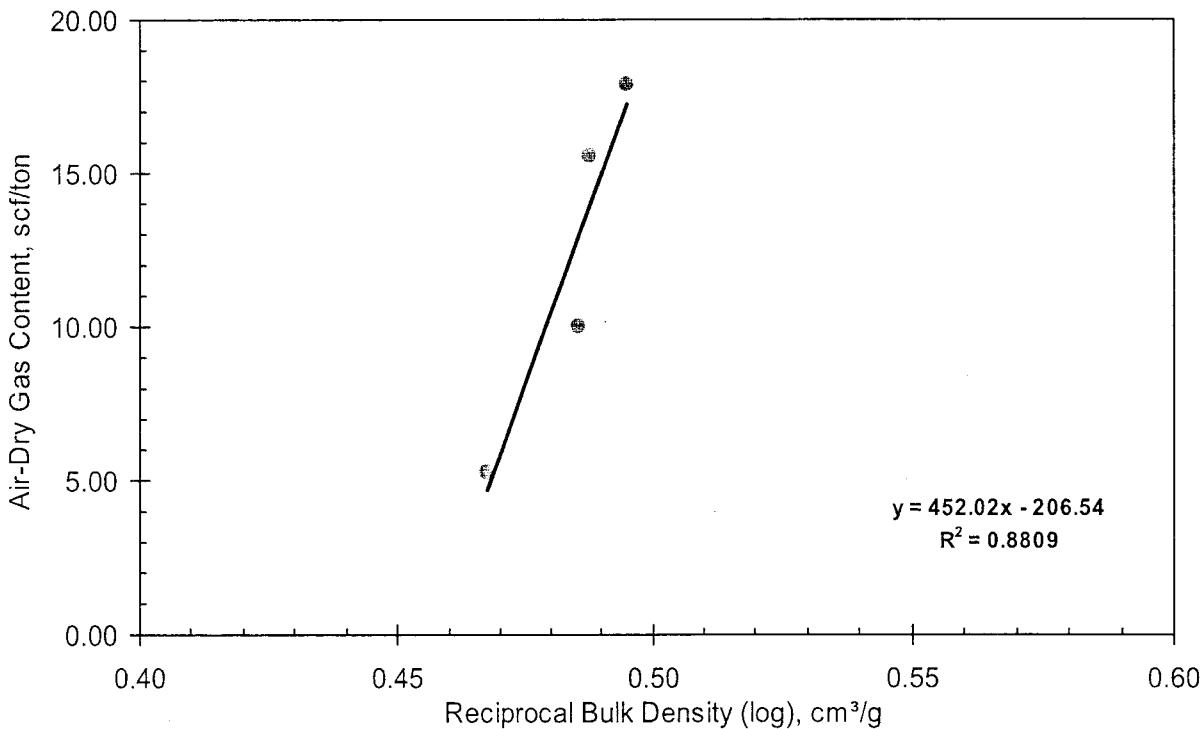


Table 3-1. Sorbed GIP Volume Estimates

Log Depth feet	Thickness feet	Bulk Density g/cm ³	Gas Content scf/ton	Gas-In-Place ¹ MMscf/160 acres
Upper Sharon Springs Member				
2,108.0	0.5	2.147	3.97	0.926
2,108.5	0.5	2.113	7.42	1.706
2,109.0	0.5	2.029	16.25	3.586
2,109.5	0.5	2.020	17.20	3.780
2,110.0	0.5	2.034	15.67	3.467
2,110.5	0.5	2.063	12.61	2.829
2,111.0	0.5	2.042	14.86	3.301
2,111.5	0.5	2.078	10.97	2.479
2,112.0	0.5	2.063	12.61	2.829
2,112.5	0.5	2.053	13.61	3.041
2,113.0	0.5	2.054	13.57	3.032
2,113.5	0.5	2.037	15.38	3.407
2,114.0	0.5	2.065	12.39	2.782
2,114.5	0.5	2.041	14.95	3.319
2,115.0	0.5	2.048	14.16	3.155
2,115.5	0.5	2.084	10.32	2.340
2,116.0	0.5	2.105	8.23	1.883
2,116.5	0.5	2.089	9.82	2.232
2,117.0	0.5	2.056	13.37	2.989
2,117.5	0.5	2.053	13.64	3.045
2,118.0	0.5	2.081	10.73	2.427
2,118.5	0.5	2.140	4.72	1.099
2,119.0	0.5	2.140	4.70	1.095
2,119.5	0.5	2.087	10.03	2.277
2,120.5	0.5	2.016	17.72	3.885
2,121.0	0.5	1.994	20.15	4.371
2,121.5	0.5	2.027	16.48	3.634
2,122.0	0.5	2.003	19.15	4.173
2,122.5	0.5	2.086	10.17	2.308
2,123.0	0.5	2.074	11.38	2.569
Mean¹		2.069	12.07	
Total				83.434

Table 3-2. Sorbed GIP Volume Estimates - Continued

Log Depth feet	Thickness feet	Bulk Density g/cm ³	Gas Content scf/ton	Gas-In-Place ¹ MMscf/160 acres
Lower Sharon Springs Member				
2,128.0	0.5	2.180	0.81	0.192
2,129.0	0.5	2.034	15.65	3.463
2,129.5	0.5	2.152	3.52	0.823
2,130.0	0.5	2.030	16.15	3.566
2,130.5	0.5	2.166	2.14	0.504
2,131.0	0.5	2.125	6.16	1.423
2,131.5	0.5	2.076	11.25	2.540
2,132.0	0.5	2.051	13.88	3.097
2,132.5	0.5	2.153	3.37	0.789
2,133.0	0.5	2.152	3.52	0.823
2,133.5	0.5	2.148	3.95	0.922
2,134.0	0.5	2.148	3.88	0.906
2,134.5	0.5	2.142	4.46	1.039
2,135.0	0.5	2.100	8.75	1.998
2,135.5	0.5	2.095	9.22	2.101
2,136.0	0.5	2.150	3.71	0.868
2,136.5	0.5	2.138	4.90	1.140
2,137.0	0.5	2.151	3.57	0.834
2,137.5	0.5	2.152	3.51	0.821
2,138.0	0.5	2.114	7.29	1.677
2,138.5	0.5	2.100	8.76	2.000
2,139.0	0.5	2.138	4.91	1.142
2,139.5	0.5	2.135	5.15	1.196
2,140.0	0.5	2.111	7.57	1.737
2,140.5	0.5	2.123	6.43	1.484
2,141.0	0.5	2.079	10.89	2.463
2,141.5	0.5	2.084	10.40	2.358
2,142.0	0.5	2.001	19.39	4.220
Mean ¹		2.119	6.87	
Total				45.142

Table 3-3. Sorbed GIP Volume Estimates - Continued

Log Depth feet	Thickness feet	Bulk Density g/cm ³	Gas Content scf/ton	Gas-In-Place ¹ MMscf/160 acres
Niobrara Member				
2,142.5	0.5	1.977	22.05	4.743
2,143.0	0.5	2.058	13.08	2.928
2,143.5	0.5	2.063	12.55	2.816
2,144.0	0.5	2.057	13.20	2.953
2,144.5	0.5	2.014	17.85	3.912
2,145.0	0.5	2.006	18.75	4.092
2,145.5	0.5	1.991	20.47	4.433
2,146.0	0.5	2.007	18.64	4.069
2,146.5	0.5	2.015	17.83	3.908
2,147.0	0.5	1.966	23.43	5.009
2,147.5	0.5	1.990	20.59	4.458
2,148.0	0.5	1.995	20.07	4.355
2,148.5	0.5	2.001	19.37	4.216
2,149.0	0.5	2.000	19.42	4.227
2,149.5	0.5	2.011	18.22	3.986
2,150.0	0.5	1.972	22.74	4.876
2,150.5	0.5	2.006	18.84	4.110
2,151.0	0.5	2.046	14.40	3.205
2,151.5	0.5	2.035	15.56	3.445
2,152.0	0.5	2.014	17.89	3.919
2,152.5	0.5	1.959	24.21	5.159
2,153.0	0.5	1.951	25.12	5.332
2,153.5	0.5	1.962	23.81	5.083
2,154.0	0.5	1.991	20.51	4.442

Log Depth feet	Thickness feet	Bulk Density g/cm ³	Gas Content scf/ton	Gas-In-Place ¹ MMscf/160 acres
Niobrara Member				
2,154.5	0.5	2.016	17.72	3.885
2,155.0	0.5	1.995	20.05	4.350
2,155.5	0.5	2.022	17.01	3.741
2,156.0	0.5	2.068	12.01	2.701
2,156.5	0.5	2.048	14.17	3.157
2,157.0	0.5	2.064	12.46	2.798
2,157.5	0.5	2.044	14.63	3.252
2,158.0	0.5	1.952	25.08	5.323
2,158.5	0.5	1.977	22.12	4.757
2,159.0	0.5	2.013	18.07	3.955
2,159.5	0.5	1.984	21.30	4.597
2,160.0	0.5	1.981	21.64	4.663
2,160.5	0.5	1.995	20.01	4.344
2,161.0	0.5	1.969	23.00	4.928
2,161.5	0.5	1.964	23.59	5.040
2,162.0	0.5	2.030	16.15	3.566
2,162.5	0.5	2.046	14.35	3.193
2,163.0	0.5	2.006	18.77	4.096
2,163.5	0.5	1.979	21.93	4.719
2,164.0	0.5	2.020	17.20	3.780
2,164.5	0.5	1.992	20.33	4.406
2,165.0	0.5	1.985	21.15	4.568
2,165.5	0.5	2.018	17.48	3.836
2,166.0	0.5	2.046	14.43	3.211
2,166.5	0.5	1.988	20.80	4.499
2,167.0	0.5	1.954	24.79	5.269
2,167.5	0.5	1.965	23.51	5.024
2,168.0	0.5	1.995	20.07	4.355
2,168.5	0.5	2.011	18.23	3.989
2,169.0	0.5	2.031	16.05	3.546
2,169.5	0.5	2.047	14.29	3.182
2,170.0	0.5	2.038	15.24	3.380
2,170.5	0.5	2.050	13.99	3.119
2,171.0	0.5	2.028	16.38	3.613
2,171.5	0.5	2.023	16.90	3.719
2,172.0	0.5	2.051	13.86	3.092
2,172.5	0.5	2.049	14.05	3.133
2,173.0	0.5	2.072	11.67	2.629
2,173.5	0.5	2.053	13.65	3.047
2,174.0	0.5	2.047	14.26	3.175
2,174.5	0.5	2.046	14.41	3.207
2,175.0	0.5	2.045	14.46	3.218
2,175.5	0.5	2.046	14.42	3.209
2,176.0	0.5	2.110	7.72	1.771
2,176.5	0.5	2.102	8.52	1.949
2,177.0	0.5	2.106	8.14	1.863
2,177.5	0.5	2.077	11.13	2.515
2,178.0	0.5	2.048	14.18	3.160
2,178.5	0.5	2.097	9.01	2.054
2,179.0	0.5	2.038	15.21	3.373
2,179.5	0.5	2.115	7.14	1.643
2,180.0	0.5	2.125	6.14	1.418
2,180.5	0.5	2.090	9.78	2.223
2,181.0	0.5	2.113	7.34	1.688
2,181.5	0.5	2.054	13.55	3.027
2,182.0	0.5	2.047	14.32	3.189
2,182.5	0.5	2.013	18.06	3.953
2,183.0	0.5	2.035	15.64	3.461
2,183.5	0.5	2.024	16.81	3.701
2,184.0	0.5	1.973	22.52	4.833
2,184.5	0.5	1.979	21.91	4.717
2,185.0	0.5	2.004	19.05	4.153
2,185.5	0.5	1.995	20.09	4.359

Log Depth feet	Thickness feet	Bulk Density g/cm ³	Gas Content scf/ton	Gas-In-Place ¹ MMscf/160 acres
Niobrara Member				
2,186.0	0.5	2.015	17.82	3.905
2,186.5	0.5	2.068	12.06	2.713
2,187.0	0.5	2.037	15.32	3.395
2,187.5	0.5	2.093	9.46	2.153
2,188.0	0.5	2.137	4.95	1.151
2,188.5	0.5	2.155	3.20	0.751
2,189.0	0.5	2.088	9.97	2.263
2,189.5	0.5	2.073	11.49	2.591
2,190.0	0.5	2.102	8.47	1.937
2,190.5	0.5	2.115	7.16	1.648
2,191.0	0.5	2.070	11.80	2.656
2,191.5	0.5	2.094	9.28	2.115
2,192.0	0.5	2.066	12.25	2.753
2,192.5	0.5	2.104	8.34	1.908
2,193.0	0.5	2.108	7.91	1.814
2,193.5	0.5	2.155	3.20	0.751
2,194.0	0.5	2.121	6.62	1.526
2,194.5	0.5	2.141	4.60	1.070
2,195.0	0.5	2.151	3.57	0.837
2,195.5	0.5	2.177	1.10	0.261
2,196.0	0.5	2.167	2.01	0.475
2,196.5	0.5	2.131	5.55	1.286
2,197.0	0.5	2.129	5.76	1.333
2,197.5	0.5	2.130	5.73	1.326
2,198.0	0.5	2.130	5.65	1.308
2,198.5	0.5	2.139	4.81	1.120
2,199.0	0.5	2.132	5.48	1.270
2,199.5	0.5	2.096	9.09	2.072
2,200.0	0.5	2.095	9.26	2.110
Mean ¹		2.045	14.68	
Total				374.499

4.0 GLOSSARY

<i>air-dry gas content</i>	the total gas volume divided by the air-dry sample weight
<i>air drying</i>	the process of partial drying of coal before further reduction and division of the sample
<i>air-dry sample weight</i>	sample weight measured after air drying the sample
<i>ash content</i>	the weight fraction of inorganic residue remaining after ignition of combustible substances measured in accordance with prescribed procedures often as part of a proximate analysis
<i>coal</i>	a readily combustible rock containing more than 50% by weight and more than 70% by volume of carbonaceous material including inherent moisture, formed by compaction and induration of variously altered plant remains similar to those in peat. Differences in the kinds of plant materials (type), in degree of metamorphism (rank) are characteristic of coal and are used in classification
<i>carbonaceous shale</i>	a dark-gray or black shale with a significant carbon content in the form of small disseminated particles or flakes; it is commonly associated with coal
<i>crushed gas content</i>	the volume of gas reported at standard conditions released by crushing a rock sample in accordance with prescribed procedures (reservoir temperature) divided by the sample weight
<i>desorption canisters</i>	pressure vessels used to capture gas released from coal and shale samples
<i>desorption data</i>	incremental and cumulative gas volumes released from a desorption canister reported at standard conditions and as a function of time generally from the start of desorption or from the time of sealing a sample in a canister
<i>desorption temperature</i>	the temperature inside desorption canisters while measuring desorption data
<i>diffusion</i>	the process by which matter is transported from one part of a system to another as a result of random molecular motions generally from a region of greater to lesser concentration
<i>diffusion coefficient</i>	the constant of proportionality in Fick's Law used to relate diffusion rate to mass concentration gradient, similar in concept to permeability in Darcy's Law that relates mass velocity to fluid density gradient and viscosity
<i>diffusivity</i>	diffusion coefficient divided by the square of an average diffusion distance
<i>drillers' depth</i>	the depth measured by the length of drill pipe and drilling bottom-hole assemblies in a wellbore reported by the drilling rig crew. Zero drillers' depth is usually the top of the Kelly bushing located roughly one foot above the rig floor
<i>dry, ash-free</i>	an adjective used to describe a theoretical basis used for reporting with no ash or moisture associated with a sample
<i>gas content</i>	the volume of gas reported at standard temperature and pressure contained within a sample divided by the sample weight. Usually used to refer to gas stored by sorption but depending upon the connotation can include gas stored by compression and sorption
<i>gas sorption time</i>	the time required to release 63.2% of the original sorbed gas content of a sample by diffusion while the sample is maintained at constant temperature and atmospheric pressure
<i>grain density</i>	the density of a crushed sample generally determined with a helium pycnometer

<i>gross thickness</i>	the vertical difference between the top depth and bottom depth of a rock interval of interest
<i>helium pycnometer</i>	a device used for measuring the density of crushed rock samples based upon Boyle's Law using helium at low pressures
<i>inorganic content</i>	the mass fraction of inorganic material within a rock sample. Often used to refer to the sum of the moisture content, ash content, and sulfur content. May differ from mineral-matter content due to alteration of minerals by the ashing process
<i>in-situ gas content</i>	the gas content of a rock sample at in-situ moisture and density conditions
<i>inherent moisture</i>	moisture that exist as an integral part of the coal seam in its natural state, including the water in pores but not that present in macroscopically visible fractures
<i>in-situ moisture content</i>	the weight fraction of inherent moisture
<i>headspace</i>	the free gas volume in a desorption canister after sealing a rock sample within
<i>high-resolution density log data</i>	open-hole density data measured with a slower logging speed than normal (often 900 feet per minute) with recorded depth points between 0.1 and 0.25 feet apart. Conventional-resolution density data are typically measured at 1,800 feet per minute and are spaced 0.5 feet apart
<i>in-situ</i>	in the original or natural position
<i>inert gas</i>	a non-reactive gas. This term is often used in the coal gas industry to refer to a non- or low sorbing gas such as helium
<i>lost gas content</i>	the gas content lost before sealing a rock sample in a desorption canister
<i>measured gas content</i>	the cumulative volume of gas reported at standard conditions that is released from a desorption canister divided by the sample weight
<i>mineral matter</i>	the inorganic material in coal
<i>moisture content</i>	the weight fraction of moisture within a sample
<i>moisture holding capacity</i>	the stabilized moisture content determined in accordance with strict procedures at reservoir temperature and 96 to 97% relative humidity used to determine inherent moisture content
<i>net thickness</i>	the thickness of a reservoir that is contributing fluids and affecting pressure changes during production
<i>organic material</i>	material composed of compounds containing carbon, especially as an essential component. Organic compounds usually have hydrogen bonded to the carbon atom
<i>oxidation</i>	the process of combining with oxygen
RapidGas SM	a process developed by TICORA Geosciences personnel that results in total gas content, rock sample density and composition, gas composition, and diffusivity data within a short period of time
<i>residual moisture</i>	moisture remaining in a sample after determining the air-dry moisture loss with prescribed procedures
<i>reservoir pressure</i>	the average pressure of a reservoir at the midpoint depth in the well of interest.
<i>reservoir temperature</i>	the average temperature of a reservoir at the midpoint depth in the well of interest
<i>sample depth</i>	the depth (top, bottom, or average) of a sample based upon drillers' depths while coring
<i>scf</i>	standard gas volume in cubic feet reported at 60 °F and, most often, 14.73 psia
<i>sorption</i>	the general physical process where gas molecules in close proximity to solid material molecules experience a net attraction to the solid molecules. Sorption can also refer to "adsorption" and "desorption" where the volume of sorbed gas increases and decreases, respectively

<i>sorption time</i>	gas sorption time
<i>standard conditions</i>	standard pressure and temperature conditions used for reporting gas volumes. In the coal gas industry, the temperature is usually at 60 °F and the pressure depends upon state reporting requirements but most commonly is at 14.73 psia.
<i>sulfur content</i>	the weight fraction of sulfur within a sample determined in accordance with ASTM D 3177 often as part of an ultimate analysis
<i>total gas content</i>	the sum of lost, measured, and crushed (or residual) gas content

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Data Summary

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

TABLE OF CONTENTS	Page
Desorption Sample Identification and Description.....	1
Desorption Sample Special Testing.....	2
Mass and Volume Data.....	3
Desorption Sample Moisture, Ash, and Sulfur.....	4
Desorption Sample Density.....	5
Desorption Total Organic Carbon.....	6
Desorption & Gas Content Summary.....	7
Gas Sorption & Diffusion Characteristics.....	8

Desorption Sample Identification and Description

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

	TICORA No.	Canister No.	Drill Depth feet	Description
Pierre Shale	Sharon Springs Member	322-1	3-111	2,110.3-2,111.3 Core 1. Headspace filled with Silica Beads. 85°F Desorption Temperature.
		322-2	3-106	2,113.8-2,114.8 Core 1. Headspace filled with Silica Beads. 85°F Desorption Temperature.
		322-3	3-108	2,117.6-2,118.6 Core 1. Headspace filled with Silica Beads. 85°F Desorption Temperature.
		322-4	3-81	2,126.0-2,127.0 Core 2. Headspace filled with Silica Beads. 85°F Desorption Temperature.
		322-5	3-82	2,128.8-2,129.8 Core 2. Headspace filled with Silica Beads. 85°F Desorption Temperature.
	Transition Zone Member	322-6	3-32	2,137.4-2,138.4 Core 3. Headspace filled with Silica Beads. 85°F Desorption Temperature.
	Niobrara Member	322-7	3-54	2,175.6-2,176.6 Core 7. Headspace filled with Silica Beads. 85°F Desorption Temperature.
		322-8	3-72	2,185.0-2,186.0 Core 8. Headspace filled with Silica Beads. 85°F Desorption Temperature.

Desorption Sample Special Testing

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

	TICORA No.	Canister No.	Drill Depth feet	Special Testing
Pierre Shale	Sharon Springs Member	322-1	3-111	2,110.3-2,111.3 Moisture, Ash and Sulfur, Total Organic Carbon. Helium Density. Crushed Gas. Gas Composition. Rock Eval.
		322-2	3-106	2,113.8-2,114.8 Long-Term Desorption.
		322-3	3-108	2,117.6-2,118.6 Moisture, Ash and Sulfur, Total Organic Carbon. Helium Density. Crushed Gas. Rock Eval.
		322-4	3-81	2,126.0-2,127.0 Long-Term Desorption.
		322-5	3-82	2,128.8-2,129.8 Long-Term Desorption.
Transition Zone Member		322-6	3-32	2,137.4-2,138.4 Moisture, Ash and Sulfur, Total Organic Carbon. Helium Density. Crushed Gas. Gas Composition.
		322-7	3-54	2,175.6-2,176.6 Long-Term Desorption.
		322-8	3-72	2,185.0-2,186.0 Moisture, Ash and Sulfur, Total Organic Carbon. Helium Density. Crushed Gas. Gas Composition.
Niobrara Member				

Mass and Volume Data

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

		Pierre Shale	TICORA	Canister	Drill Depth	Sample Mass				Volume			
						Raw	Air-Dry	Dry	"In-Situ"	Bulk Sample	Head Space	Desorption	Desorption to Headspace
						No.	No.	feet	g	g	g	cm ³	cm ³
Sharon Springs Member	322-1	Sharon Springs Member	3-111	2,110.3-2,111.3	2,692	2,481	2,390	N/D	1,260	798	584	0.73	
	322-2		3-106	2,113.8-2,114.8	2,784	N/D	N/D	N/D	1,360	1,278	1,014	0.79	
	322-3		3-108	2,117.6-2,118.6	2,826	2,593	2,508	N/D	1,300	578	482	0.83	
	322-4		3-81	2,126.0-2,127.0	2,887	N/D	N/D	N/D	1,325	1,013	592	0.58	
	322-5		3-82	2,128.8-2,129.8	2,404	N/D	N/D	N/D	1,100	1,118	177	0.16	
Transition Zone Member	322-6	Transition Zone Member	3-32	2,137.4-2,138.4	2,273	1,971	1,928	N/D	1,050	638	153	0.24	
	322-7		3-54	2,175.6-2,176.6	2,830	N/D	N/D	N/D	1,300	938	396	0.42	
Niobrara Member	322-8	Niobrara Member	3-72	2,185.0-2,186.0	3,054	2,729	2,661	N/D	1,420	838	591	0.70	

N/D - Not Determined. Termination of project.

			Average Data									
			Sample Mass				Volume					
			Raw	Air-Dry	Dry	"In-Situ"	Bulk Sample	Head Space	Desorption	Desorption to Headspace		
			g	g	g	g	cm ³	cm ³	cm ³	Ratio		
Sharon Springs Member												
Average			2,719	2,537	2,449	N/D	1,269	957	570	0.62		
Standard Deviation			190	79	84	N/D	101	274	300	0.28		

Desorption Sample Moisture, Ash, and Sulfur

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

			Chemistry							
Pierre Shale	TICORA	Canister	Drill Depth	Moisture			Ash		Sulfur	
	No.	No.	feet	Residual	Total	Holding Capacity	Air-Dry	In-Situ	Air-Dry	In-Situ
				fraction	fraction	fraction	fraction	fraction	fraction	fraction
Sharon Springs Member	322-1	3-111	2,110.3-2,111.3	0.0366	0.1122	N/D	0.7454	N/D	0.0731	N/D
	322-2	3-106	2,113.8-2,114.8	N/D	N/D	N/D	N/D	N/D	N/D	N/D
	322-3	3-108	2,117.6-2,118.6	0.0327	0.1124	N/D	0.7345	N/D	0.1065	N/D
	322-4	3-81	2,126.0-2,127.0	N/D	N/D	N/D	N/D	N/D	N/D	N/D
	322-5	3-82	2,128.8-2,129.8	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Transition Zone Member	322-6	3-32	2,137.4-2,138.4	0.0219	0.1518	N/D	0.6678	N/D	0.0239	N/D
	322-7	3-54	2,175.6-2,176.6	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Niobrara Member	322-8	3-72	2,185.0-2,186.0	0.0249	0.1286	N/D	0.7001	N/D	0.0650	N/D

N/D - Not Determined. Termination of project.

Average Data							
	Moisture			Ash		Sulfur	
	Residual	Total	Holding Capacity	Air-Dry	In-Situ	Air-Dry	In-Situ
	fraction	fraction	fraction	fraction	fraction	fraction	fraction
Sharon Springs Member							
Average	0.0347	0.1123	N/D	0.7399	N/D	0.0898	N/D
Standard Deviation	0.0027	0.0002	N/D	0.0077	N/D	0.0236	N/D

Desorption Sample Density

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

				Density						
				TICORA	Canister	Drill Depth	Water Displacement	Helium Displacement		
				No.	No.	feet	Bulk	Air-Dry	Dry	In-Situ
							g/cm ³	g/cm ³	g/cm ³	g/cm ³
Pierre Shale	Sharon Springs Member	322-1	3-111	2,110.3-2,111.3		2.139	2.112	2.154	N/D	
		322-2	3-106	2,113.8-2,114.8		2.051	N/D	N/D	N/D	
		322-3	3-108	2,117.6-2,118.6		2.027	2.145	2.184	N/D	
		322-4	3-81	2,126.0-2,127.0		2.184	N/D	N/D	N/D	
		322-5	3-82	2,128.8-2,129.8		2.175	N/D	N/D	N/D	
	Transition Zone Member	322-6	3-32	2,137.4-2,138.4		2.188	2.147	2.173	N/D	
	Niobrara Member	322-7	3-54	2,175.6-2,176.6		2.190	N/D	N/D	N/D	
		322-8	3-72	2,185.0-2,186.0		2.156	2.211	2.242	N/D	

N/D - Not Determined. Termination of project.

Average Data						
		Water Displacement	Helium Displacement			
		Bulk	Air-Dry	Dry	In-Situ	
		g/cm ³	g/cm ³	g/cm ³	g/cm ³	
Sharon Springs Member						
Average		2.07	2.129	2.169	N/D	
Standard Deviation		0.06	0.023	0.021	N/D	

Desorption Sample Total Organic Carbon

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

	TICORA	Canister	Drill Depth	Total Organic Carbon					
				No.	No.	feet	Air-Dry	Dry	In-Situ
							fraction	fraction	fraction
Pierre Shale	Sharon Springs Member	322-1	3-111	2,110.3-2,111.3	0.1198	0.1244	N/D		
		322-2	3-106	2,113.8-2,114.8	N/D	N/D	N/D		
		322-3	3-108	2,117.6-2,118.6	0.1203	0.1244	N/D		
		322-4	3-81	2,126.0-2,127.0	N/D	N/D	N/D		
		322-5	3-82	2,128.8-2,129.8	N/D	N/D	N/D		
	Transition Zone Member	322-6	3-32	2,137.4-2,138.4	0.0501	0.0512	N/D		
	Niobrara Member	322-7	3-54	2,175.6-2,176.6	N/D	N/D	N/D		
		322-8	3-72	2,185.0-2,186.0	0.0645	0.0661	N/D		

N/D - Not Determined. Termination of project.

Average Data			
	Total Organic Carbon		
	Air-Dry	Dry	In-Situ
	fraction	fraction	fraction
Sharon Springs Member			
Average	0.1201	0.1244	N/D
Standard Deviation	0.0004	0.0000	N/D

**Desorption & Gas Content Summary
Air-Dry, Dry-Ash-Free and In-Situ Weight Bases**

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

Sample No.	Canister No	Drill Depth	Air-Dry Sample Weight	Lost Gas		Measured Gas		Crushed Gas		Total Gas		
				Calculated USBM	Calculated USBM Volume	Measured Desorbed	Measured Desorbed Volume	Measured Crushed	Measured Crushed Gas Content	Air-Dry Total	Kerogen Rich Total	In-Situ Total
		feet	grams	%	scf/ton	%	scf/ton	%	scf/ton	scf/ton	scf/ton	scf/ton
Sharon Springs Member. Core Sample. 85°F Desorption Temperature. Headspace filled with Silica Beads												
322-1	3-111	2,110.3-2,111.3	2,480.9	26.48	4.74	42.16	7.55	31.37	5.62	17.90	149.42	N/D
322-2	3-106	2,113.8-2,114.8	2,784.0	35.43	6.40	64.57	11.67	0.00	0.00	18.07	N/D	N/D
322-3	3-108	2,117.6-2,118.6	2,593.1	23.29	3.63	38.25	5.96	38.46	5.99	15.57	129.45	N/D
322-4	3-81	2,126.0-2,127.0	2,887.0	21.96	1.85	78.04	6.57	0.00	0.00	8.41	N/D	N/D
322-5	3-82	2,128.8-2,129.8	2,404.0	35.97	1.32	64.03	2.36	0.00	0.00	3.68	N/D	N/D
Transition Zone Member. Core Sample. 85°F Desorption Temperature. Headspace filled with Silica Beads												
322-6	3-32	2,137.4-2,138.4	1,971.1	44.03	2.31	47.30	2.48	8.67	0.46	5.25	104.77	N/D
Niobrara Member. Core Sample. 85°F Desorption Temperature. Headspace filled with Silica Beads												
USBM = United States Bureau of Mines Lost Gas Method DAF= Dry, Ash-Free												
Desorption Data Summary												
Sharon Springs Member. Core Sample. 85°F Desorption Temperature. Headspace filled with Silica Beads												
Average		2,619.3	28.40	4.92	46.32	8.39	23.26	3.87	17.18	139.44	N/D	
Standard Deviation		153.3	6.29	1.40	14.20	2.95	20.47	3.36	1.39	14.12	N/D	
USBM = United States Bureau of Mines Lost Gas Method DAF= Dry, Ash-Free												

N/D - Not Determined, Termination of project.

Gas Sorption & Diffusion Characteristics

**Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale**

Sample No.	Canister No.	Drill Depth	Sample Competency Factor	Core Diameter	Shape Factor	Sorption Time (63.2%)	Diffusivity (63.2%)	Gradient of Lost Gas Slope	Sorption Time (Direct Method)	Diffusivity (Direct Method)
		feet		inches		hours	sec ⁻¹		hours	sec ⁻¹
Sharon Springs Member. Core Sample. 85°F Desorption Temperature.										
322-1	3-111	2,110.3-2,111.3	Competent	3.00	15	198.59	9.32E-08	0.77	418.14	4.43E-08
322-3	3-108	2,117.6-2,118.6	Competent	3.00	15	365.82	5.06E-08	0.56	584.40	3.17E-08
Transition Zone Member. Core Sample. 85°F Desorption Temperature.										
322-6	3-32	2,137.4-2,138.4	Semi-competent	3.00	15	0.91	2.03E-05	2.76	2.44	7.58E-06
Niobrara Member. Core Sample. 85°F Desorption Temperature.										
322-8	3-72	2,185.0-2,186.0	Competent	3.00	15	67.34	2.75E-07	0.98	79.94	2.32E-07

Average Data					
Sharon Springs Member. Core Sample. 85°F Desorption Temperature.					
Average	282.21	7.19E-08	0.66	501.27	3.80E-08
Standard Deviation	118.25	3.01E-08	0.14	117.56	8.91E-09

Appendix I

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Lithological Description and Photography

TICORA Geosciences, Inc



Core Lithology

Client Name: Ansbro Petroleum

Well Name: Lowe Ranch 41-24

TICORA NO: 322

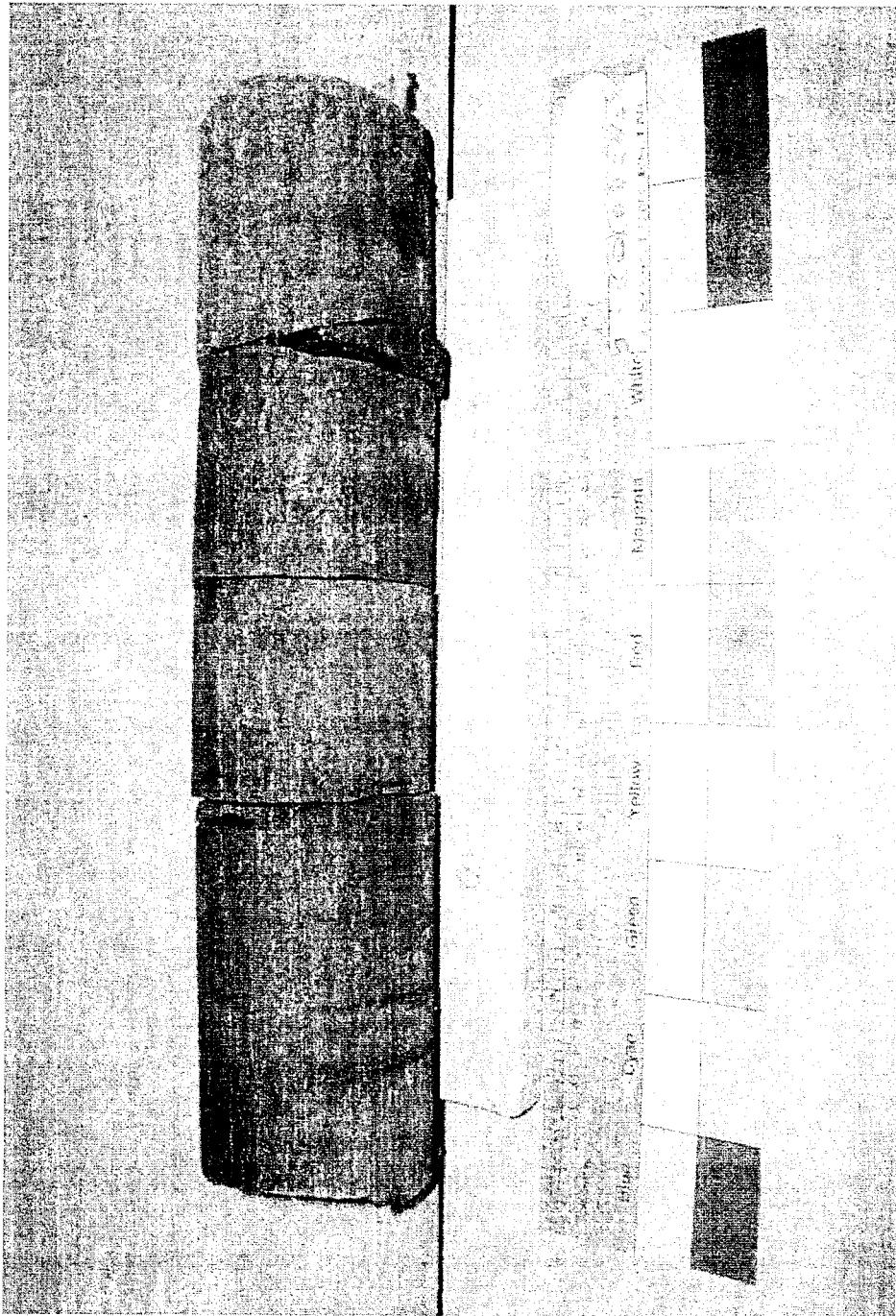
Sample Interval

SAMPLE ID.	CANISTER ID.	SAMPLE INTERVAL		COAL			MUDSTONE			GRAINSTONE			DESCRIPTION																								
		Depth Drilled (feet)	Length (inches)	Non-Banded		Banded		Shale color			Sandstone			OTHER			COLOR			Integrity			Fluid Sensitivity			Carbonate Mineralization			Organic (Humic)			Exsudalinite (Resinite)			Texture		
				E	M	D	E	M	D	S	F	M	C	S	F	M	C	R	E	M	S	E	M	S	E	M	S	E	M	S	E	M	S				
322-1	3-111	2,110.3-2,111.3	12.00	3.00						X																											
322-3	3-108	2,117.6-2,118.6	12.00	3.00						X																											
322-6	3-32	2,137.4-2,138.4	12.00	3.00						X																											
322-8	3-72	2,185.0-2,186.0	12.00	3.00						X																											



Core Photography

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale



Sharon Springs

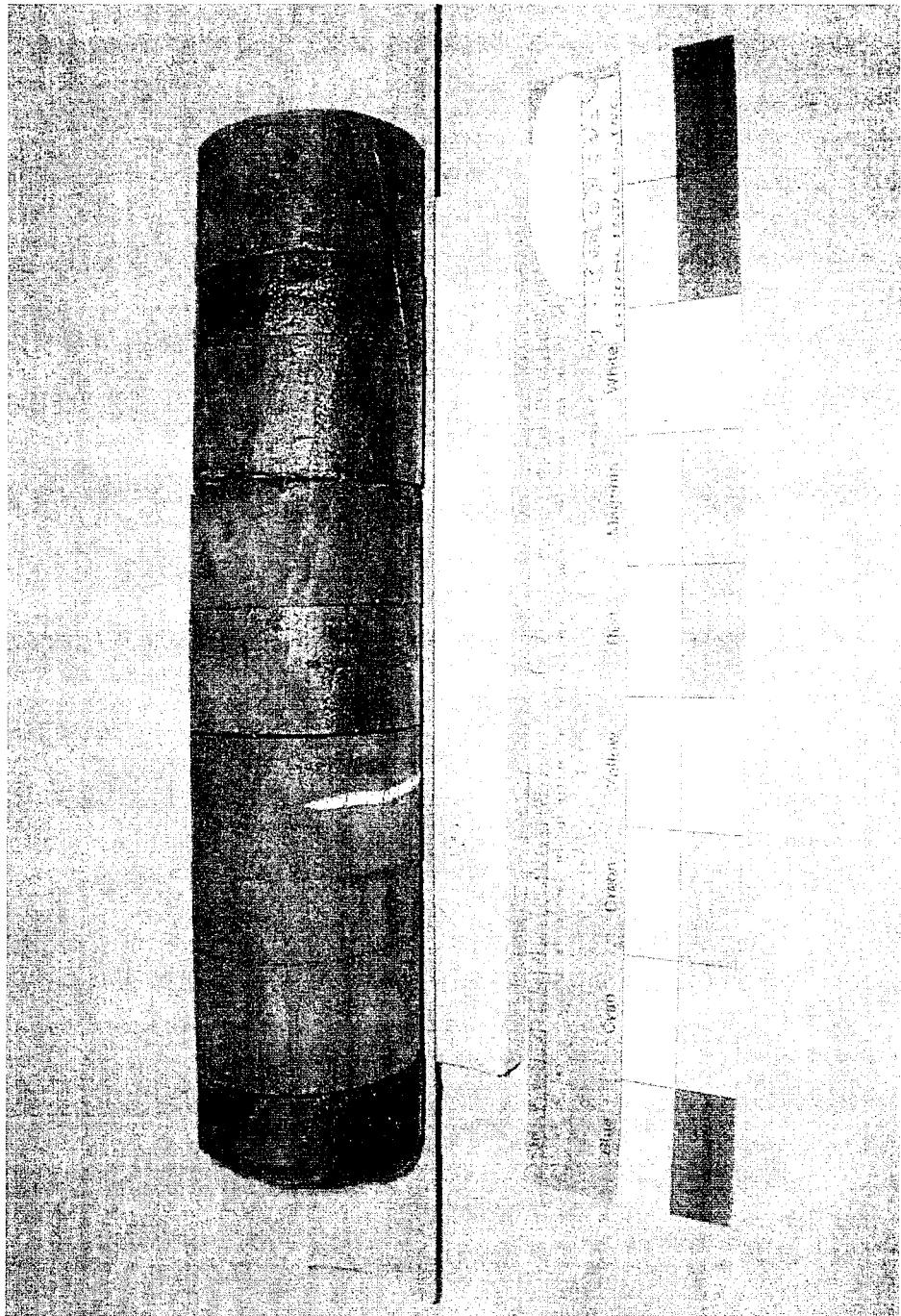
TICORA 322-1

2,110.3-2,111.3 feet



Core Photography

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale

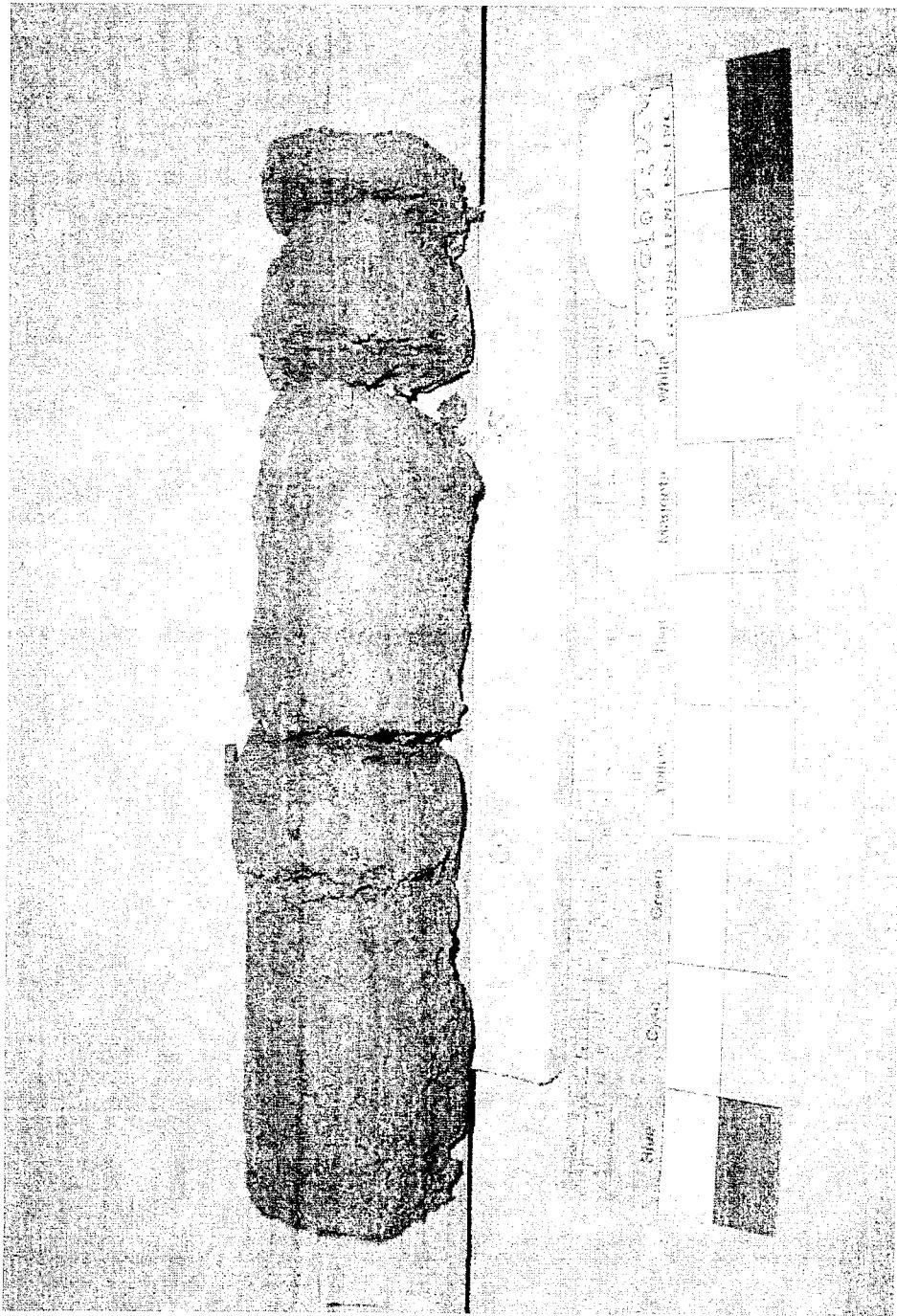


Sharon Springs TICORA 322-3 2,117.6-2,118.6 feet



Core Photography

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale



Transition Zone

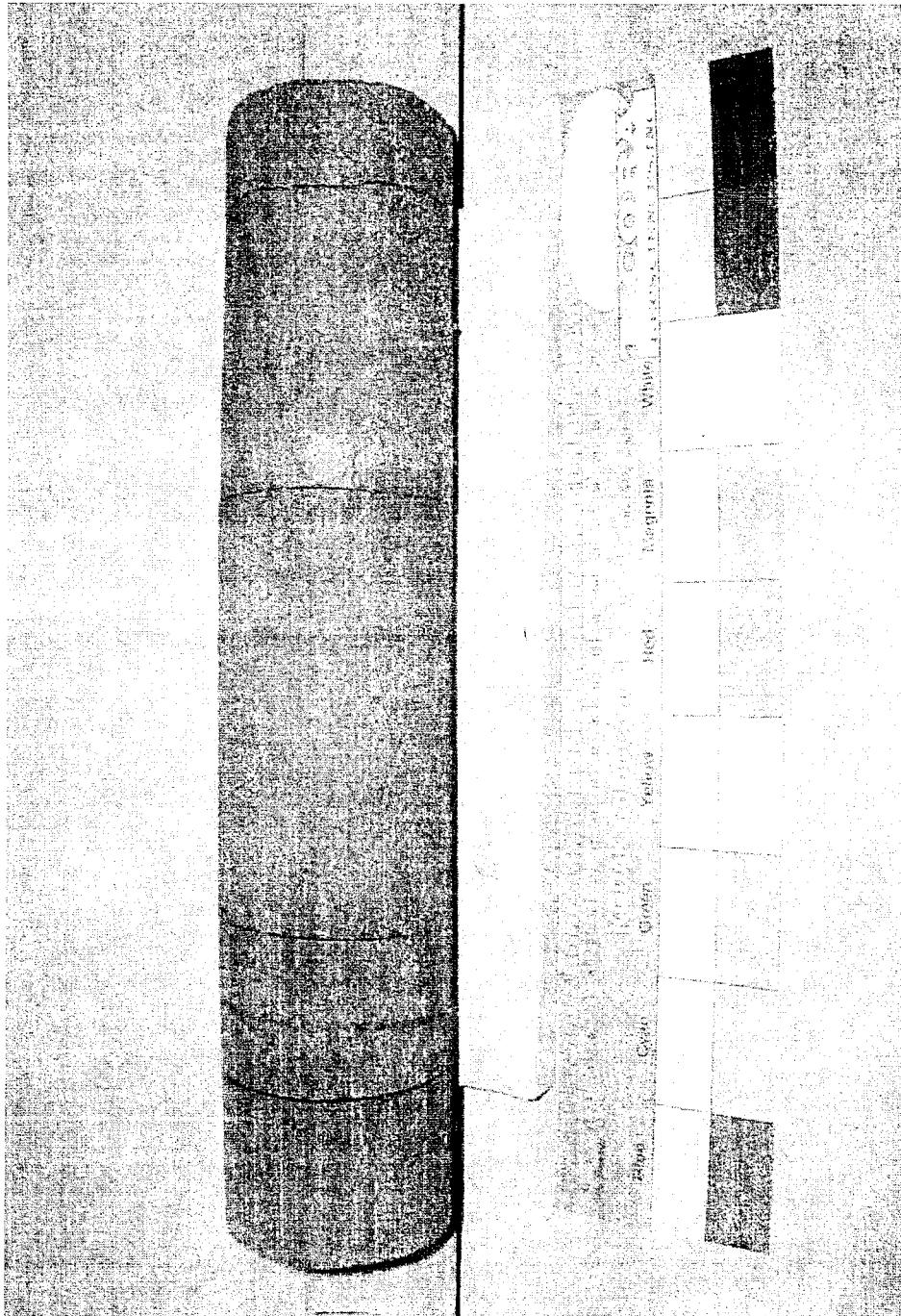
TICORA 322-6

2,137 4-2,138.4 feet



Core Photography

Ansbro Petroleum Company, L.L.C.: Lowe Ranch 41-24
Continuous Core (3.0-inch Diameter), 8 Canisters, Pierre Shale



Niobrara

TICORA 3222-8

2,185.0-2,186.0 feet

TICORA Geosciences, Inc

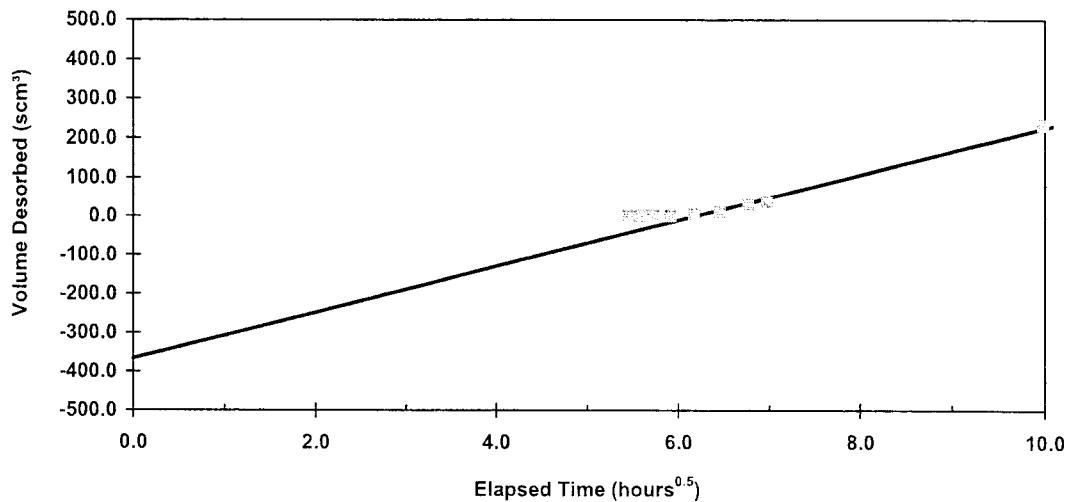
Appendix II

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Desorption Graphs

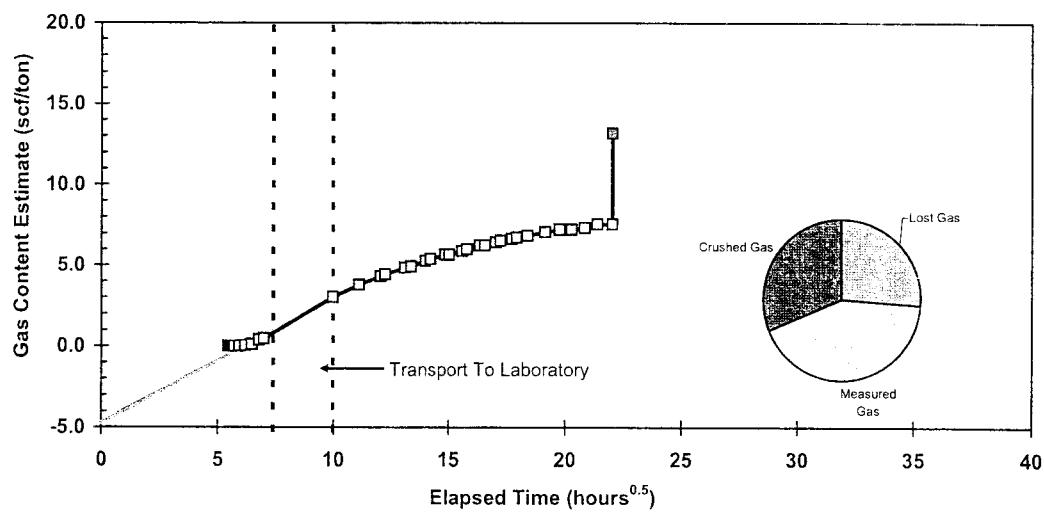
TICORA Geosciences, Inc

Lost Gas Extrapolation & Desorption Graphs
Ansbro Petroleum: Lowe Ranch 41-24
TICORA Sample No.: 322-1 - Upper Sharon Springs Member

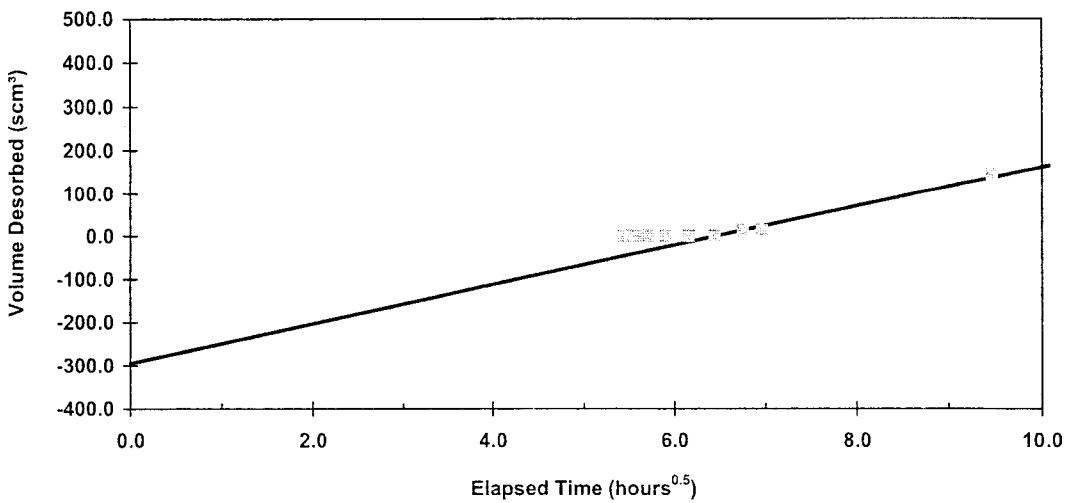


Drill Depth: 2,110.3-2,111.3 feet

85 °F Desorption Temperature

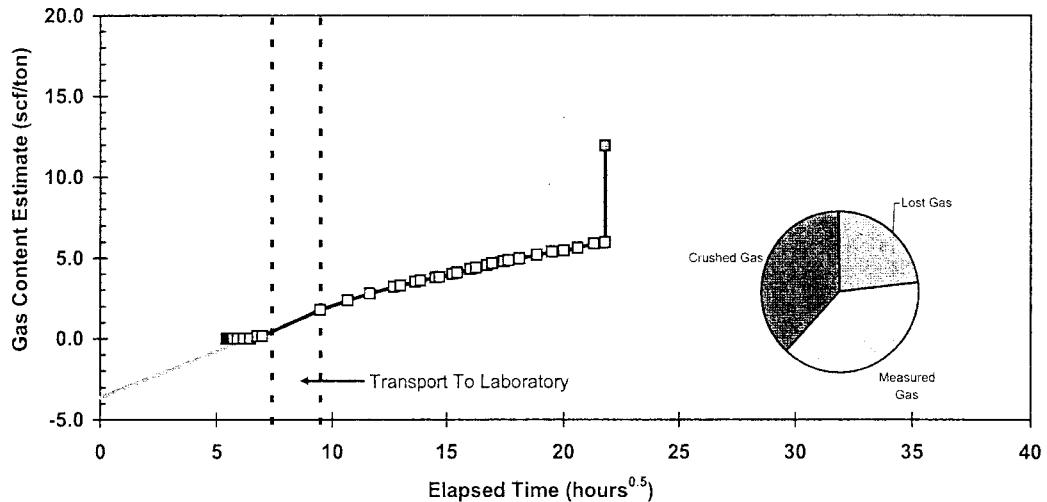


Lost Gas Extrapolation & Desorption Graphs
Ansbro Petroleum: Lowe Ranch 41-24
TICORA Sample No.: 322-3 - Upper Sharon Springs Member

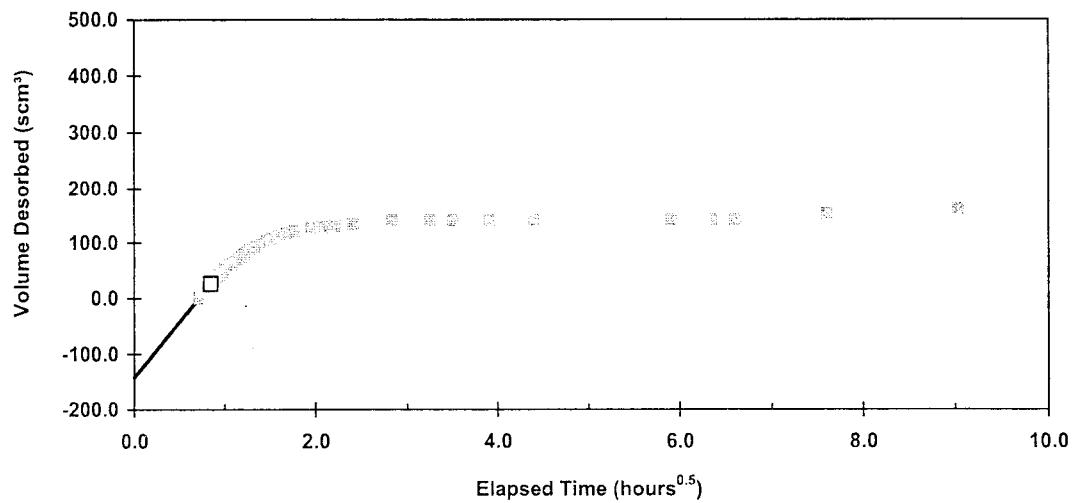


Drill Depth: 2,117.6-2,118.6 feet

85 °F Desorption Temperature

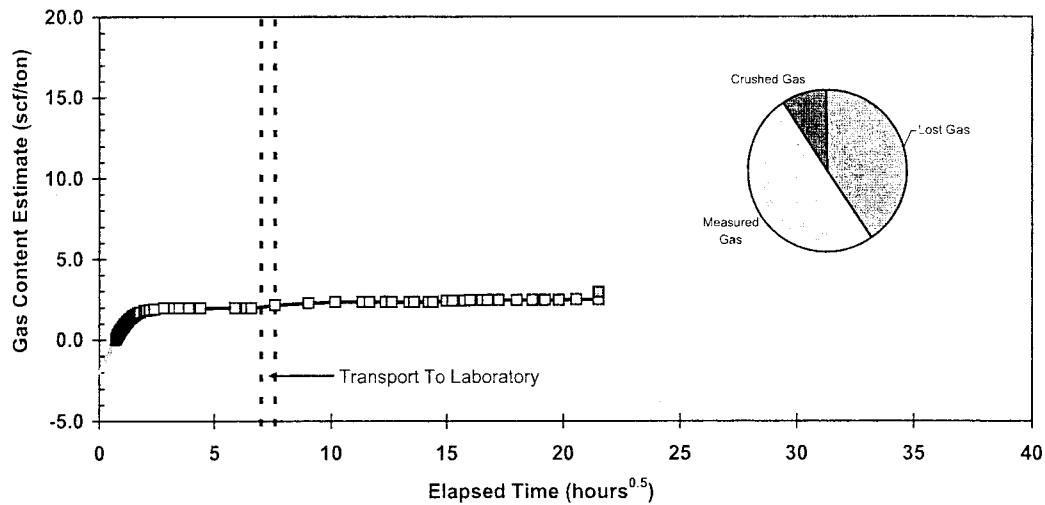


Lost Gas Extrapolation & Desorption Graphs
Ansbro Petroleum: Lowe Ranch 41-24
TICORA Sample No.: 322-6 - Transition Zone

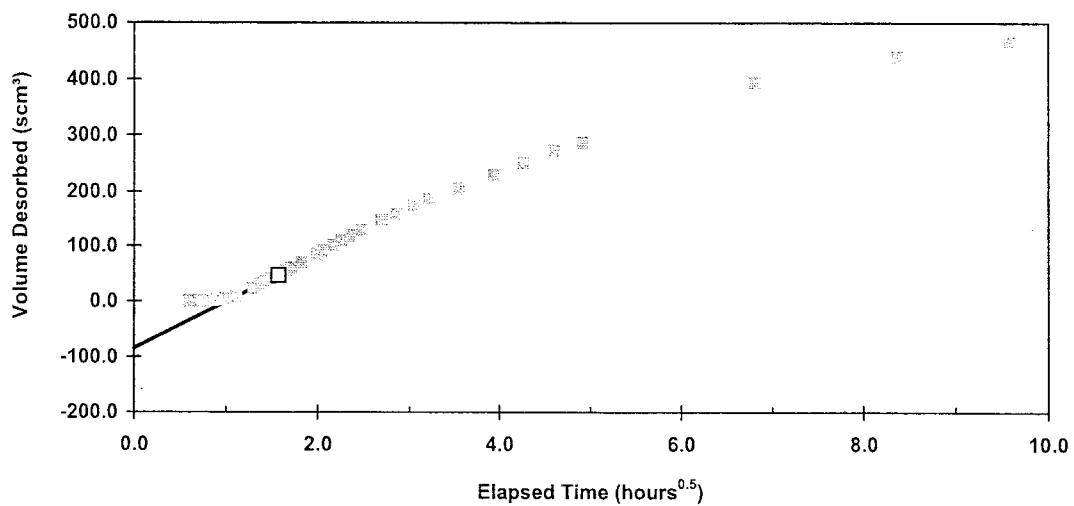


Drill Depth: 2,137.4-2,138.4 feet

85 °F Desorption Temperature

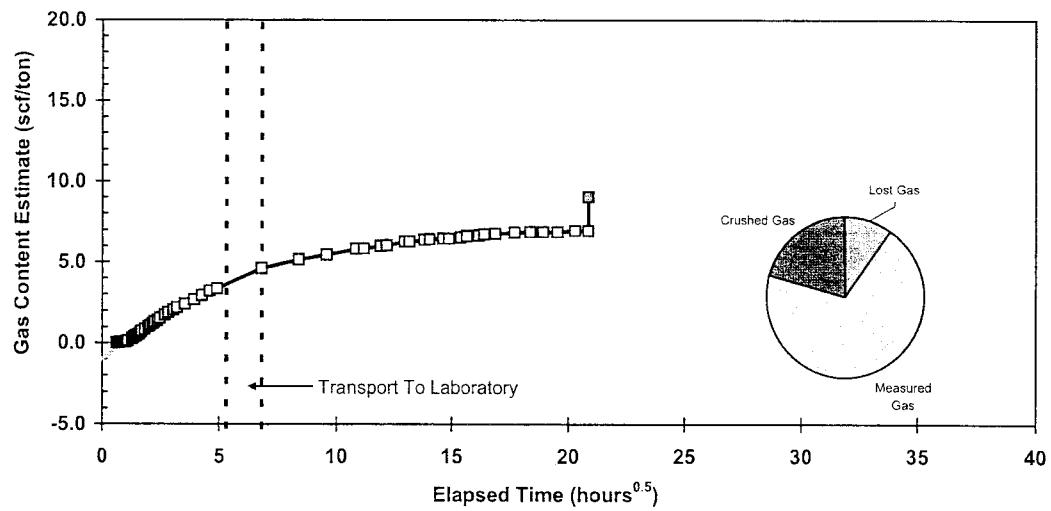


Lost Gas Extrapolation & Desorption Graphs
Ansbro Petroleum: Lowe Ranch 41-24
TICORA Sample No.: 322-8 - Niobrara Member



Drill Depth: 2,185.0-2,186.0 feet

85 °F Desorption Temperature



Appendix III

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Grain Density Data

TICORA Geosciences, Inc



Multipycnometer Helium Density Summary

True Powder Density

TICORA No.: 322

Client: Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24 Dates Performed: 30/01/03-02/04/04

Sample No.	Depth feet	Density, g/cm ³			Standard Deviation	Mean Density g/cm ³
		A	B	C		
322-1-RPG	2,110.3' - 2,111.3'	2.119	2.104	2.142	0.019	2.122
322-3-RpG	2,117.6' - 2,118.6'	2.174	2.142	2.118	0.028	2.145
322-6-RpG	2,137.4' - 2,138.4'	2.151	2.142	2.210	0.037	2.168
322-8-RpG	2,185.0' - 2,186.0'	2.199	2.212	2.222	0.011	2.211



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	MAW
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	1
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-1-RPG-A	Time Start:	9:12
Depth Interval (feet):	2,110.3' - 2,111.3'	Time Finish:	9:54
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm^3 :	90.640
Cell Weight, grams:	25.859	Cell Volume (V_c), cm^3 :	146.927
Sample + Cell, grams:	117.962		
Sample Weight, grams:	92.103		

DATA	
P_1	17.459
P_2	8.153
V_s	43.469
Sample Density (D_s), g/cm^3	2.119

OPERATIONAL EQUATIONS

$$\begin{aligned} V_s &= V_c - V_R((P_1/P_2)-1) \\ D_s &= M_s/V_s \end{aligned}$$

$$\begin{aligned} D_s &= \text{Sample Density } (\text{cm}^3/\text{g}) & V_R &= \text{Reference Volume } (\text{cm}^3) \\ M_s &= \text{Sample Weight } (\text{g}) & P_1 &= \text{Pressure of Reference Volume} \\ V_s &= \text{Sample Volume } (\text{cm}^3) & P_2 &= \text{Pressure of System} \\ V_c &= \text{Volume of Sample Cell } (\text{cm}^3) \end{aligned}$$



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	MAW
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	1
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-1-RPG-B	Time Start:	9:12
Depth Interval (feet):	2,110.3' - 2,111.3'	Time Finish:	9:54
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm^3 :	90.640
Cell Weight, grams:	25.859	Cell Volume (V_c), cm^3 :	146.927
Sample + Cell, grams:	118.532		
Sample Weight, grams:	92.673		

DATA	
P_1	17.286
P_2	8.096
V_s	44.039
Sample Density (D_s), g/cm^3	2.104

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R / ((P_1/P_2) - 1)$$

$$D_s = M_s / V_s$$

$$\begin{aligned} D_s &= \text{Sample Density } (\text{cm}^3/\text{g}) & V_R &= \text{Reference Volume } (\text{cm}^3) \\ M_s &= \text{Sample Weight } (\text{g}) & P_1 &= \text{Pressure of Reference Volume} \\ V_s &= \text{Sample Volume } (\text{cm}^3) & P_2 &= \text{Pressure of System} \\ V_c &= \text{Volume of Sample Cell } (\text{cm}^3) \end{aligned}$$



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	MAW
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	1
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-1-RPG-C	Time Start:	9:12
Depth Interval (feet):	2,110.3' - 2,111.3'	Time Finish:	9:54
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	90.640
Cell Weight, grams:	25.859	Cell Volume (V_c), cm ³ :	146.927
Sample + Cell, grams:	116.639		
Sample Weight, grams:	90.780		

DATA	
P_1	17.304
P_2	8.036
V_s	42.388
Sample Density (D_s), g/cm ³	2.142

OPERATIONAL EQUATIONS

$$\begin{aligned} D_s &= V_s \cdot V_c \cdot V_R ((P_1/P_2) - 1) & V_R &= \text{Reference Volume (cm}^3\text{)} \\ D_s &= M_s / V_s & P_1 &= \text{Pressure of Reference Volume} \\ M_s &= \text{Sample Weight (g)} & P_2 &= \text{Pressure of System} \\ V_s &= \text{Sample Volume (cm}^3\text{)} & V_c &= \text{Volume of Sample Cell (cm}^3\text{)} \end{aligned}$$



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/01/04
Sample No.:	322-3-RpG-A	Time Start:	15:50
Depth Interval (feet):	2,117.6' - 2,118.6'	Time Finish:	16:20
Sample Description:	Crushed	Ambient Temperature (°F):	80.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.223	Cell Volume (V_c), cm ³ :	146.970
Sample + Cell, grams:	117.751		
Sample Weight, grams:	92.528		

DATA	
P_1	17.169
P_2	7.430
V_s	42.560
Sample Density (D_s), g/cm ³	2.174

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R / ((P_1/P_2) - 1)$$

$$D_s = M_s / V_s$$

D_s = Sample Density (cm³/g)
 M_s = Sample Weight (g)
 V_s = Sample Volume (cm³)
 V_c = Volume of Sample Cell (cm³)

V_R = Reference Volume (cm³)
 P_1 = Pressure of Reference Volume
 P_2 = Pressure of System



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/01/04
Sample No.:	322-3-RpG-B	Time Start:	15:50
Depth Interval (feet):	2,117.6' - 2,118.6'	Time Finish:	16:20
Sample Description:	Crushed	Ambient Temperature (°F):	80.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.223	Cell Volume (V_c), cm ³ :	146.970
Sample + Cell, grams:	118.917		
Sample Weight, grams:	93.694		

DATA	
P_1	17.321
P_2	7.544
V_s	43.736
Sample Density (D_s), g/cm ³	2.142

OPERATIONAL EQUATIONS

$$\begin{aligned}V_s &= V_c \cdot V_R / ((P_1/P_2) - 1) \\D_s &= M_s / V_s\end{aligned}$$

$$\begin{aligned}D_s &= \text{Sample Density (cm}^3/\text{g}) & V_R &= \text{Reference Volume (cm}^3) \\M_s &= \text{Sample Weight (g)} & P_1 &= \text{Pressure of Reference Volume} \\V_s &= \text{Sample Volume (cm}^3) & P_2 &= \text{Pressure of System} \\V_c &= \text{Volume of Sample Cell (cm}^3)\end{aligned}$$



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/01/04
Sample No.:	322-3-RpG-C	Time Start:	15:50
Depth Interval (feet):	2,117.6' - 2,118.6'	Time Finish:	16:20
Sample Description:	Crushed	Ambient Temperature (°F):	80.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.223	Cell Volume (V_c), cm ³ :	146.970
Sample + Cell, grams:	118.323		
Sample Weight, grams:	93.100		

DATA	
P_1	17.420
P_2	7.596
V_s	43.950
Sample Density (D_s), g/cm ³	2.118

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R \left(\frac{P_1}{P_2} - 1 \right)$$

$$D_s = M_s / V_s$$

V_R = Reference Volume (cm³)
 P_1 = Pressure of Reference Volume
 P_2 = Pressure of System
 V_c = Volume of Sample Cell (cm³)
 M_s = Sample Weight (g)
 V_s = Sample Volume (cm³)
 D_s = Sample Density (cm³/g)



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/01/04
Sample No.:	322-6-RpG-A	Time Start:	16:20
Depth Interval (feet):	2,137.4' - 2,138.4'	Time Finish:	16:50
Sample Description:	Crushed	Ambient Temperature (°F):	80.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm^3 :	79.656
Cell Weight, grams:	25.223	Cell Volume (V_c), cm^3 :	146.970
Sample + Cell, grams:	115.936		
Sample Weight, grams:	90.713		

DATA	
P_1	17.520
P_2	7.566
V_s	42.173
Sample Density (D_s), g/cm^3	2.151

OPERATIONAL EQUATIONS

$$\begin{aligned}V_s &= V_c \cdot V_R / (P_1/P_2) - 1 \\D_s &= M_s / V_s\end{aligned}$$

$$\begin{aligned}D_s &= \text{Sample Density } (\text{cm}^3/\text{g}) & V_R &= \text{Reference Volume } (\text{cm}^3) \\M_s &= \text{Sample Weight } (\text{g}) & P_1 &= \text{Pressure of Reference Volume} \\V_s &= \text{Sample Volume } (\text{cm}^3) & P_2 &= \text{Pressure of System} \\V_c &= \text{Volume of Sample Cell } (\text{cm}^3)\end{aligned}$$



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbio Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/01/04
Sample No.:	322-6-RpG-B	Time Start:	16:20
Depth Interval (feet):	2,137.4' - 2,138.4'	Time Finish:	16:50
Sample Description:	Crushed	Ambient Temperature (°F):	80.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.223	Cell Volume (V_c), cm ³ :	146.970
Sample + Cell, grams:	116.189		
Sample Weight, grams:	90.966		

DATA	
P_1	17.062
P_2	7.380
V_s	42.467
Sample Density (D_s), g/cm ³	2.142

OPERATIONAL EQUATIONS

$$D_s = V_c \cdot V_R / (P_1/P_2 - 1)$$
$$D_s = M_s/V_s$$

D_s = Sample Density (cm³/g) V_R = Reference Volume (cm³)
 M_s = Sample Weight (g) P_1 = Pressure of Reference Volume
 V_s = Sample Volume (cm³) P_2 = Pressure of System
 V_c = Volume of Sample Cell (cm³)



Multipycnometer Helium Density Work Sheet
True Powder Density

TICORA
GEOSCIENCES, INC.

322

Ticora No.:

Client: Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24

Sample No.: 322-6-RpG-C

Depth Interval (feet): 2,137.4' - 2,138.4'

Sample Description: Crushed

Outgassing Conditions: Purged for 2-minutes at 1.5 psi

Pycnometer:

DEM

2

04/01/04

Date:

16:20

Time Start:

16:50

Time Finish:

80.0

Ambient Temperature (°F):

Cell Size: Large (covered)
Cell Weight, grams: 25.223
Reference Volume (V_R), cm³: 79.656
Sample + Cell, grams: 116.023
Cell Volume (V_c), cm³: 146.970
Sample Weight, grams: 90.800

DATA	
P_1	17.155
P_2	7.365
V_s	41.086
Sample Density (D_s), g/cm ³	2.210

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R \left(\frac{P_1}{P_2} - 1 \right)$$
$$D_s = M_s / V_s$$

D_s = Sample Density (cm³/g)

M_s = Sample Weight (g)

V_s = Sample Volume (cm³)

V_c = Volume of Sample Cell (cm³)

V_R = Reference Volume (cm³)

P_1 = Pressure of Reference Volume

P_2 = Pressure of System



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-8-RpG-A	Time Start:	9:10
Depth Interval (feet):	2,185.0' - 2,186.0'	Time Finish:	9:40
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.220	Cell Volume (V_c), cm ³ :	147.004
Sample + Cell, grams:	117.963		
Sample Weight, grams:	92.743		

DATA	
P_1	17.131
P_2	7.397
V_s	42.182
Sample Density (D_s), g/cm ³	2.199

OPERATIONAL EQUATIONS

$$D_s = \frac{V_s}{V_c} \cdot V_R \left(\frac{P_1}{P_2} - 1 \right)$$
$$D_s = M_s / V_s$$

D_s = Sample Density (cm³/g)
 M_s = Sample Weight (g)
 V_s = Sample Volume (cm³)
 V_c = Volume of Sample Cell (cm³)

V_R = Reference Volume (cm³)
 P_1 = Pressure of Reference Volume
 P_2 = Pressure of System



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansdro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-8-RpG-B	Time Start:	9:10
Depth Interval (feet):	2,185.0' - 2,186.0'	Time Finish:	9:40
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.220	Cell Volume (V_c), cm ³ :	147.004
Sample + Cell, grams:	118.322		
Sample Weight, grams:	93.102		

DATA	
P_1	17.257
P_2	7.448
V_s	42.097
Sample Density (D_s), g/cm ³	2.212

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R \left(\frac{P_1}{P_2} - 1 \right)$$
$$D_s = M_s / V_s$$

D_s = Sample Density (cm³/g)
 M_s = Sample Weight (g)
 V_s = Sample Volume (cm³)
 V_c = Volume of Sample Cell (cm³)

V_R = Reference Volume (cm³)
 P_1 = Pressure of Reference Volume
 P_2 = Pressure of System



Multipycnometer Helium Density Work Sheet

True Powder Density

Ticora No.:	322	Operator:	DEM
Client:	Ansbro Petroleum Company, L.L.C.	Pycnometer:	2
Well Name:	Lowe Ranch 41-24	Date:	04/02/04
Sample No.:	322-8-RpG-C	Time Start:	9:10
Depth Interval (feet):	2,185.0' - 2,186.0'	Time Finish:	9:40
Sample Description:	Crushed	Ambient Temperature (°F):	75.0
Outgassing Conditions:	Purged for 2-minutes at 1.5 psi		

Cell Size:	Large (covered)	Reference Volume (V_R), cm ³ :	79.656
Cell Weight, grams:	25.220	Cell Volume (V_c), cm ³ :	147.004
Sample + Cell, grams:	117.957		
Sample Weight, grams:	92.737		

DATA	
P_1	17.081
P_2	7.358
V_s	41.745
Sample Density (D_s), g/cm ³	2.222

OPERATIONAL EQUATIONS

$$V_s = V_c \cdot V_R / ((P_1/P_2) - 1)$$

$$D_s = M_s / V_s$$

D_s = Sample Density (cm³/g)
 M_s = Sample Weight (g)
 V_s = Sample Volume (cm³)
 V_c = Volume of Sample Cell (cm³)

V_R = Reference Volume (cm³)
 P_1 = Pressure of Reference Volume
 P_2 = Pressure of System

Appendix IV

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Shale Testing

Humble Labs

TOC and ROCK-EVAL DATA REPORT

Ticora Geosciences

HGS No.	Well Name	Sample Type	Leco TOC	Notes Checks
04-2379-081554	322-40	ground rock	6.94	
04-2379-081555	322-41	ground rock	9.88	
04-2379-081556	322-42	ground rock	11.22	
04-2379-081557	322-43	ground rock	12.46	c
04-2379-081558	322-44	ground rock	11.96	
04-2379-081559	322-45	ground rock	12.49	
04-2379-081560	322-46	ground rock	13.18	c
04-2379-081561	322-47	ground rock	11.03	
04-2379-081562	322-48	ground rock	6.37	
04-2379-081563	322-49	ground rock	6.09	
04-2379-081564	322-50	ground rock	5.98	
04-2379-081565	322-52	ground rock	5.08	

TOC = weight percent organic carbon in rock

Notes:

c = analysis checked and confirmed

TOC and ROCK-EVAL DATA REPORT

Ticora Geosciences											
HGS No.	Sample Id	Sample Type	Leco TOC	S1	S2	S3	Tmax (°C)	Cal. %Ro	Meas. %Ro	HI	OI
04-2397-081853	322-1	ground rock	11.98	1.60	60.49	3.03	415	0.31	505	20	13
04-2397-081854	322-3	ground rock	12.03	1.81	56.85	3.50	415	0.31	473	29	16
04-2397-081856	322-6	ground rock	5.01	-	-	-	-	-	-	-	-
04-2397-081856	322-8	ground rock	6.45	-	-	-	-	-	-	-	-

Note: “-” indicates not measured or meaningless ratio

- * Tmax data not reliable due to poor S2 peak
- TOC = weight percent organic carbon in rock
- S1, S2 = mg hydrocarbons per gram of rock
- S3 = mg carbon dioxide per gram of rock
- Tmax = °C

HI = hydrogen index = $S2 \times 100 / TOC$
 OI = oxygen index = $S3 \times 100 / TOC$
 S1/TOC = normalized oil content = $S1 \times 100 / TOC$
 PI = production index = $S1 / (S1+S2)$
 Measured %Ro = calculated vitrinite reflectance based on Tmax
 Cal. %Ro = measured vitrinite reflectance

Notes:

C = Rock-Eval analysis checked and confirmed
 LC = Leco TOC analysis checked and confirmed
 Program:
 n=normal
 lS2sh = low temperature S2 shoulder
 lS2p = low temperature S2 peak
 hS2p = high temperature S2 peak
 f = flat S2 peak

KEROGEN QUALITY
Ticora Geosciences

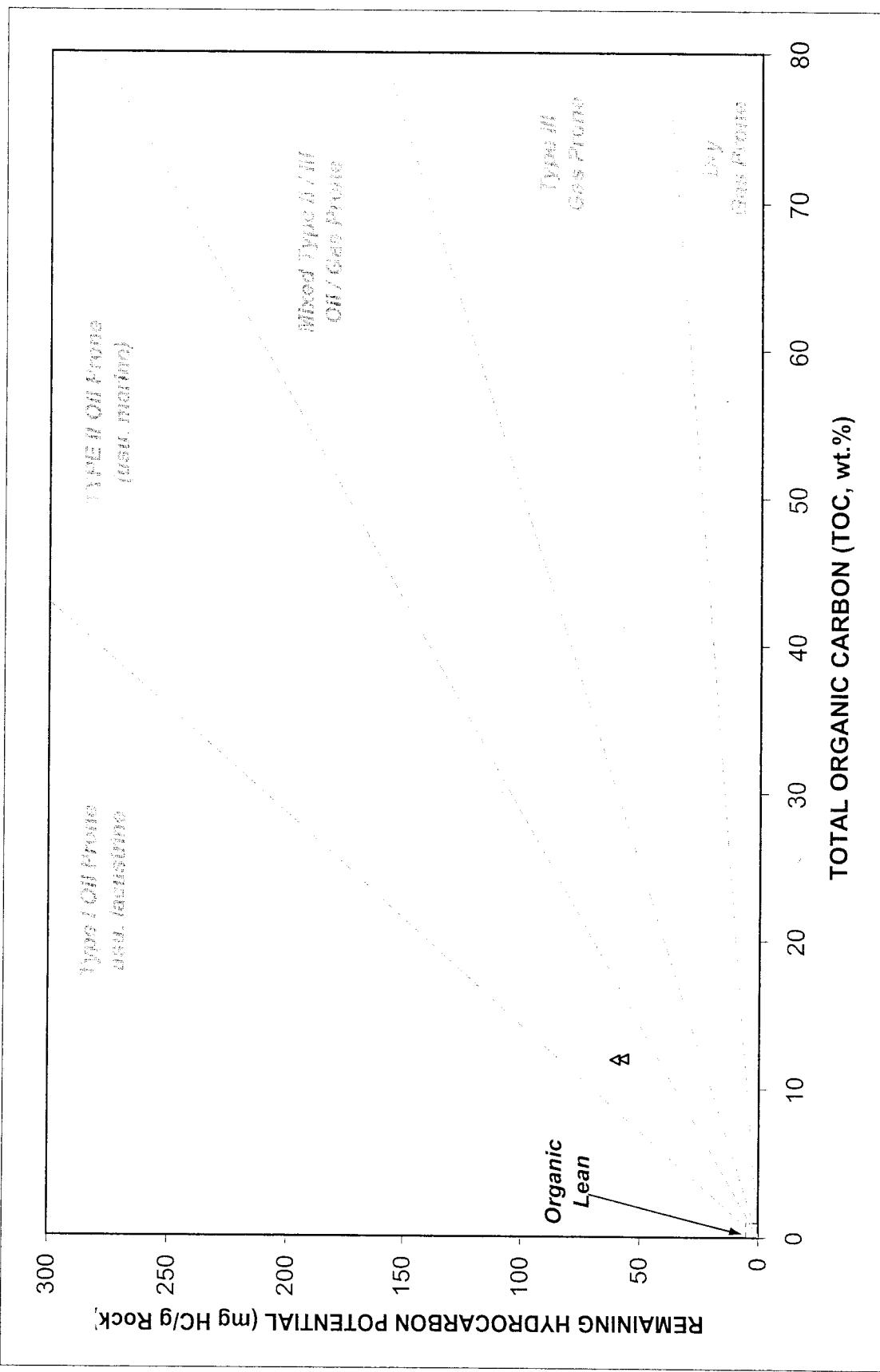


Figure 1. Kerogen Quality

Humble Geochemical Services Division

KEROGEN TYPE
Ticora Geosciences

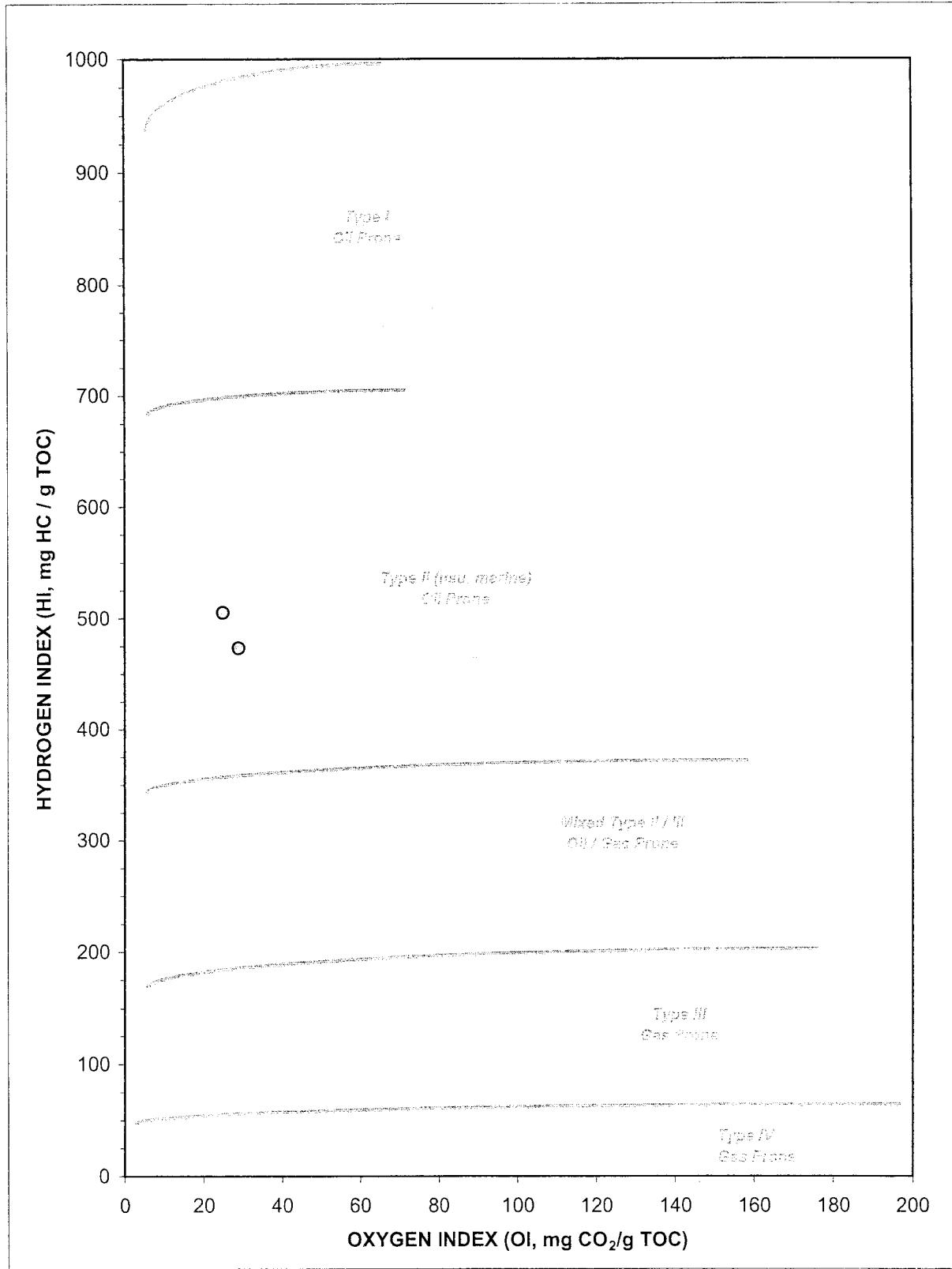


Figure 2. Kerogen type

KEROGEN TYPE and MATURITY

Ticora Geosciences

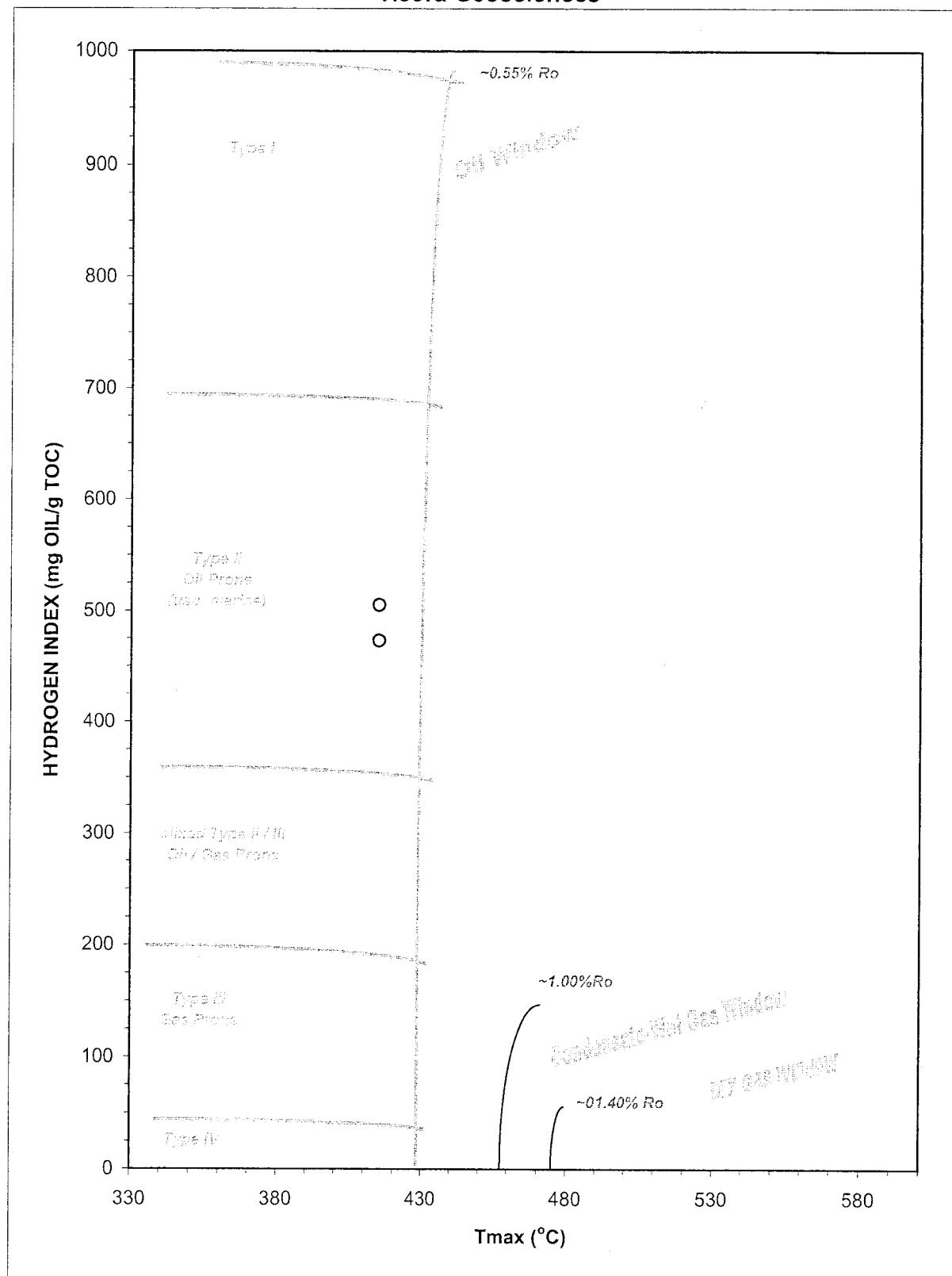


Figure 3a. Kerogen Type and Maturity (Tmax)

Humble Geochemical Services Division

KEROGEN TYPE and MATURITY
Ticora Geosciences

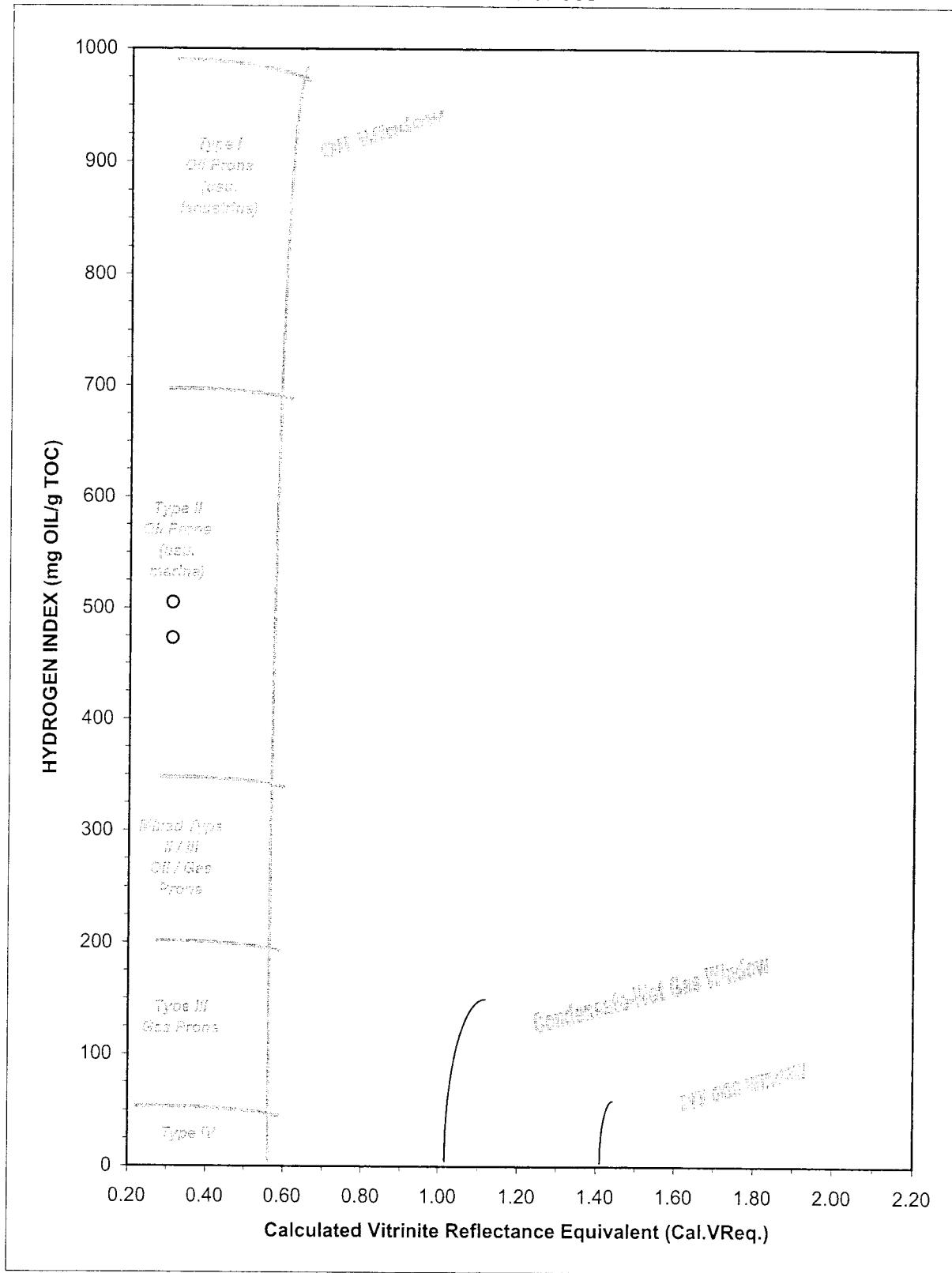


Figure 3b. Kerogen Type and Maturity (Tmax calculated %VRo)
Humble Geochemical Services Division

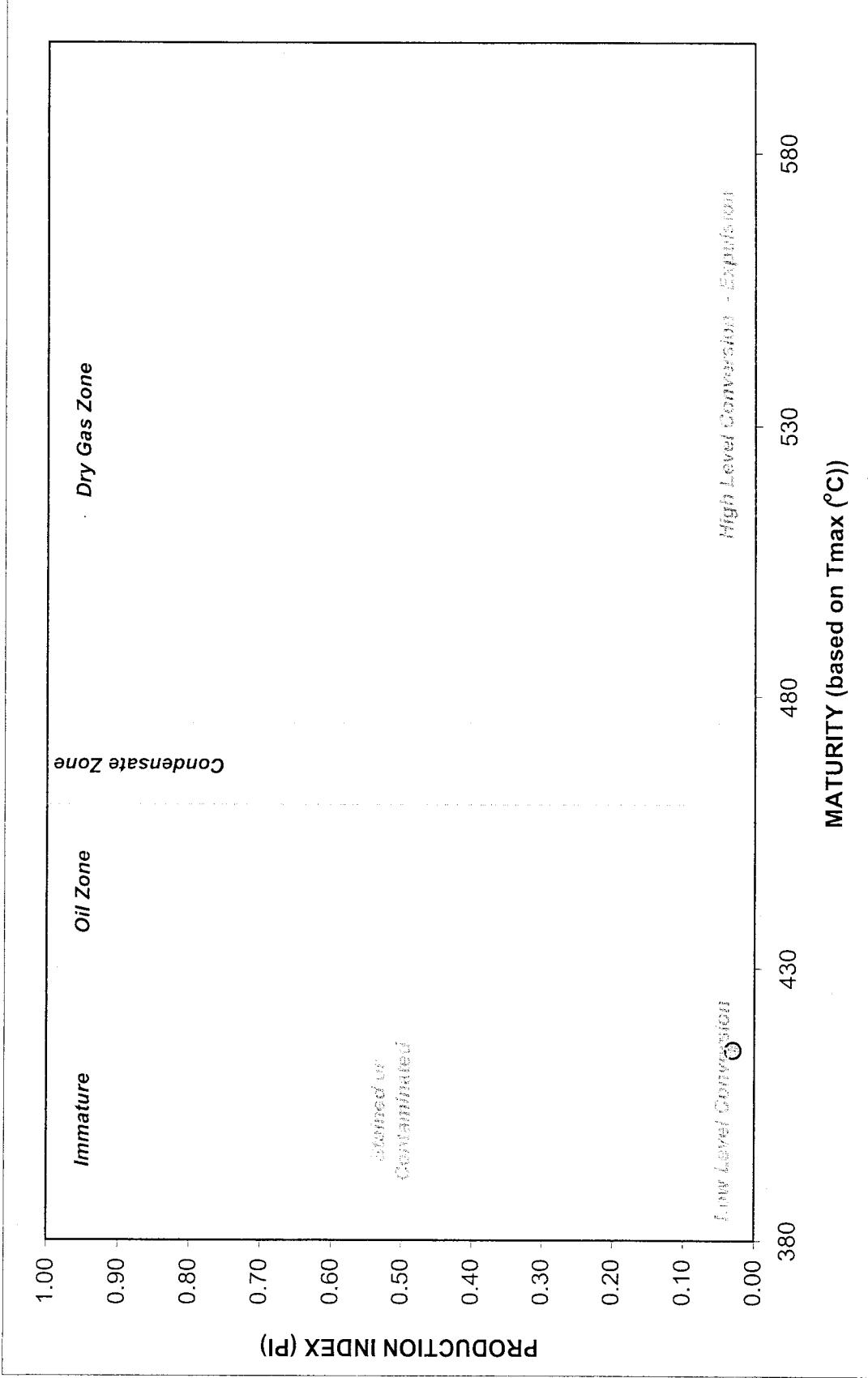


Figure 4a. Kerogen conversion and maturity (based on Tmax).

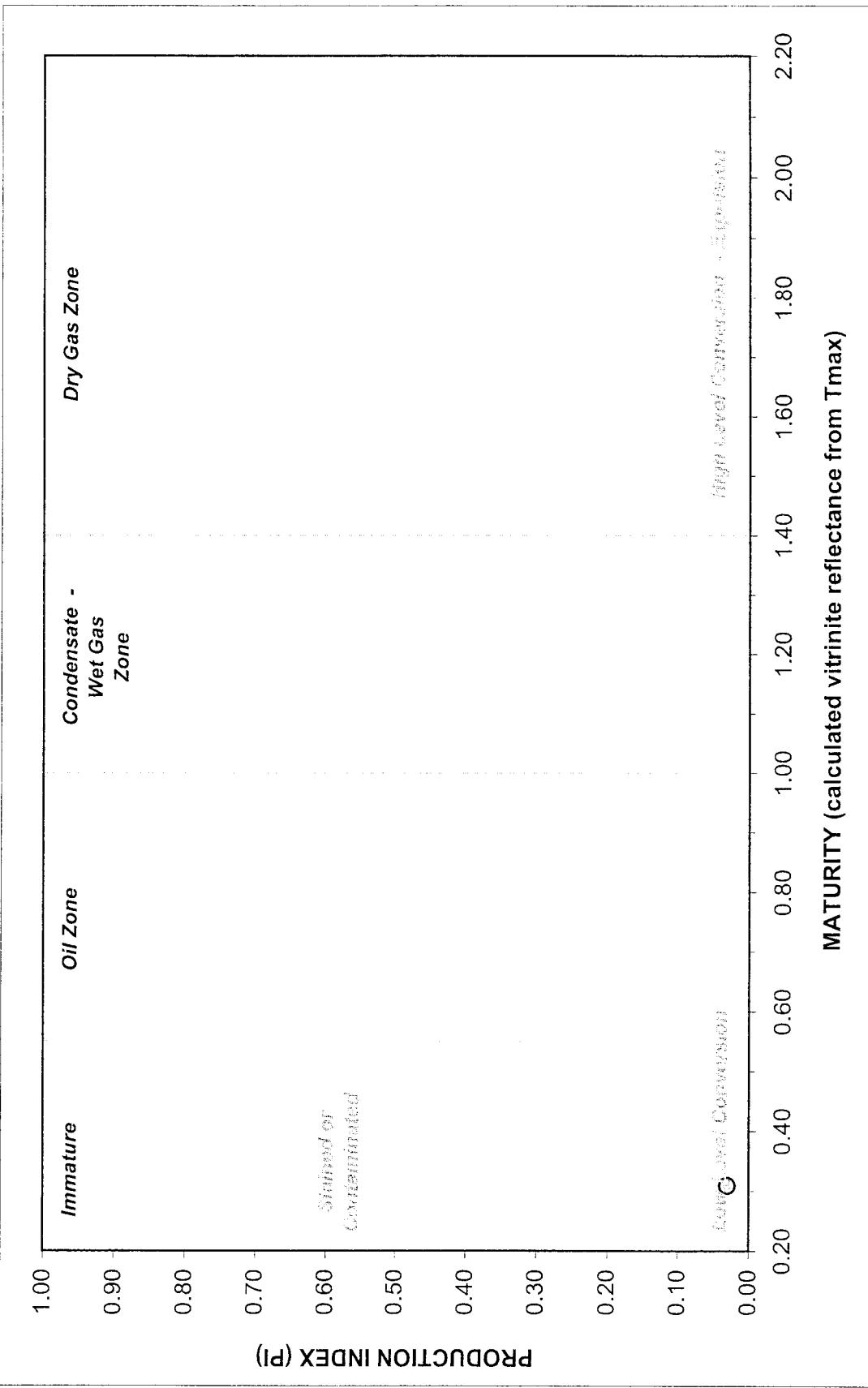


Figure 4b. Kerogen conversion and maturity (calculated %VRo from Tmax).



Humble Geochemical Services
Division of Humble Instruments & Services, Inc.
218 Higgins Street Humble, Texas 77338
P.O. Box 789 Humble, Texas 77347
Telephone: 281-540-6050 **Fax:** 281-540-2864

Summary Visual Kerogen and Vitrinite Reflectance Report

Ticora
Samples 322-1 & 322-3

Introduction:

Two samples were analyzed for vitrinite reflectance thermal maturity (%Ro) and for visual kerogen study. The 2 samples have %Ro values of 0.42% and 0.50%. TAI and fluorescence data are compatible. These samples are interpreted to be thermally immature but one is close to the early oil window thermal maturity which is generally given as the %Ro range of 0.5% to 0.7%. Both samples are strongly dominated by amorphous kerogen and should be liquid hydrocarbon prone at higher thermal maturities.

Thermal Maturity Discussion:

Vitrinite reflectance data are of good quality. Vitrinite particles are common but not abundant. There is a sparse presence of vitrinite particles that read just a little higher than the range chosen as indigenous. These are interpreted to be from a slightly more oxidized vitrinite population, or they could come from recycling. Several pollen types are present in rare abundance and the TAI is estimated at 2- to 2-, 2 (yellow to yellow orange colors). The pollen grains fluoresce a bright yellow color which is compatible with the Ro and TAI data. The amorphous kerogen also fluoresces, which is compatible with the %Ro and the TAI data.

Other Discussion:

Both samples have abundant to very abundant finely disseminated and framboidal pyrite. This can be indicative of marine influence. See Table 3: Pyrite types and abundance in kerogen. The sulfate reducing bacteria activity on organic matter in marine deposits reportedly can result in these types of pyrite. It is normally most common in hydrogen rich (reducing) marine source rocks. No marine palynomorphs were noted.

No direct evidence of vitrinite suppression was noticed on these samples. However, when the Rock-Eval pyrolysis HI values are high (300 or higher), as they are with these samples, then some suppression effect might be present. If present the %Ro value might actually be a little higher than reported here.

Various spreadsheets and or plots herein include data on vitrinite reflectance measurements, kerogen types & abundances, pyrite types & abundances and fluorescence colors & intensities.

Dan Pearson
For Humble Geochemical Services

Table 1. Dispersed Organic Matter Thermal Alteration, Kerogen Type and Total Compositional Analysis

Client:	Ticora	Contact:	Mike Watt	Sample Type:	Ground Rock	Source Quality		TOC	Cleant ID	HGS ID	Max (°C)	Hydrogen Index (HI)	Color	% Source Material	Preservation	Recovery	% Kerogen Comp.		Amorphous Kerogen	Recycled Vitrinite	Marinite	Dead Oil, Solid Bitumen	Amorphous Kerogen	# of Readings	Total Sample Ro (%)	# of Readings	Inhalogenous Ro (%)	Comments
						Source	Quality																					
04-2397-081653	322-1	11.98	60.49	50.5	415	Y	YO	1.7.2	93	5	2		X		trace	3	trace	3	95	40	0.54	24	0.42					
04-2397-081654	322-3	12.03	56.85	47.3	415	Y	YO	2	92	5	3		X		trace	2	trace	2	95	40	0.51	31	0.50					

Color Abbreviations:

GL=Y= Green-Light Yellow
 B= Brown
 DBDG= Dark Brown-Dark Gray
 DGBL= Dark Gray-Black
 BLK= Black
 LB= Light Brown

TAI Scale:

1=Unaltered
 1+= or 1.5
 2=Slight alteration
 2+= or 2.5
 3=Moderate alteration
 3+= or 3.5
 4=Strong alteration
 4+= or 4.5
 5=Severe alteration

Table 2. Kerogen Fluorescence colors and brightness intensities

Client: Ticora
Contact: Mike Watt
Sample Type: Ground Rock

1 = very low intensity	G = Green		
2 = low intensity	Y = Yellow		
3 = medium intensity	O = Orange		
4 = high intensity	B = Brown		
5 = very high intensity			
HGS ID	Herbaceous	Amorphous	Mounting Medium
	G Y O B	G Y O B	G Y O B
04-2397-081853	4	2 2	1
04-2397-081854	4	2 2	1

Table 3. Pyrite types and abundance in kerogen

Client: Ticora
Contact: Mike Watt
Sample Type: Ground Rock

1 = very rare

2 = rare

3 = common

4 = abundant

5 = very abundant

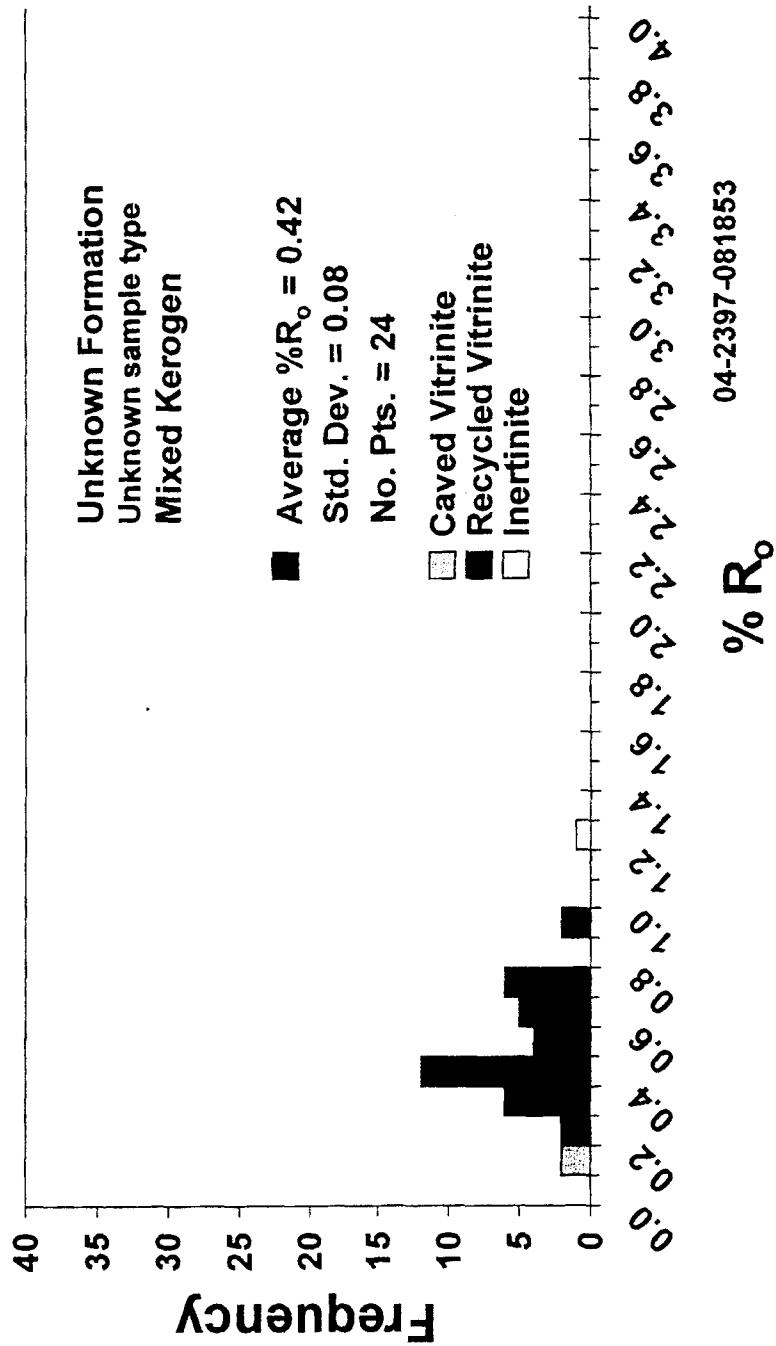
HGS ID	Pyrite types		
	Finely Disseminated	Euhedral	Framboidal
04-2397-081853	5	2	4
04-2397-081854	5	2	5

Table 4. Individual Reflectance Readings

Client:	Ticora	Contact:	Mike Watt
Sample Type:	Ground Rock		
HGS ID	04-2397-081853	04-2397-081854	
Client ID	322-1	322-3	
	All Data	Indigenous Data	All Data
	0.14	0.26	0.14
	0.15	0.27	0.16
	0.26	0.30	0.28
	0.27	0.31	0.38
	0.30	0.34	0.39
	0.31	0.36	0.42
	0.34	0.38	0.42
	0.36	0.39	0.44
	0.38	0.40	0.46
	0.39	0.41	0.46
	0.40	0.41	0.47
	0.41	0.42	0.48
	0.41	0.42	0.48
	0.42	0.43	0.48
	0.42	0.44	0.48
	0.43	0.45	0.48
	0.44	0.46	0.48
	0.45	0.47	0.48
	0.46	0.47	0.49
	0.47	0.49	0.49
	0.47	0.51	0.49
	0.49	0.52	0.50
	0.51	0.53	0.50
	0.52	0.56	0.51
	0.53		0.51
	0.56		0.51
	0.61		0.52
	0.64		0.54
	0.66		0.55
	0.66		0.55
	0.68		0.57
	0.73		0.59
	0.73		0.61
	0.76		0.62
	0.78		0.66
	0.79		0.68
	0.79		0.70
	0.95		0.70
	0.96		0.72
	1.42		0.79
Average %R ₀	0.54	0.42	0.51
Standard Dev.	0.08		0.06
# of Points	24		31
<i>Available Geotechnical Services</i>		40	31

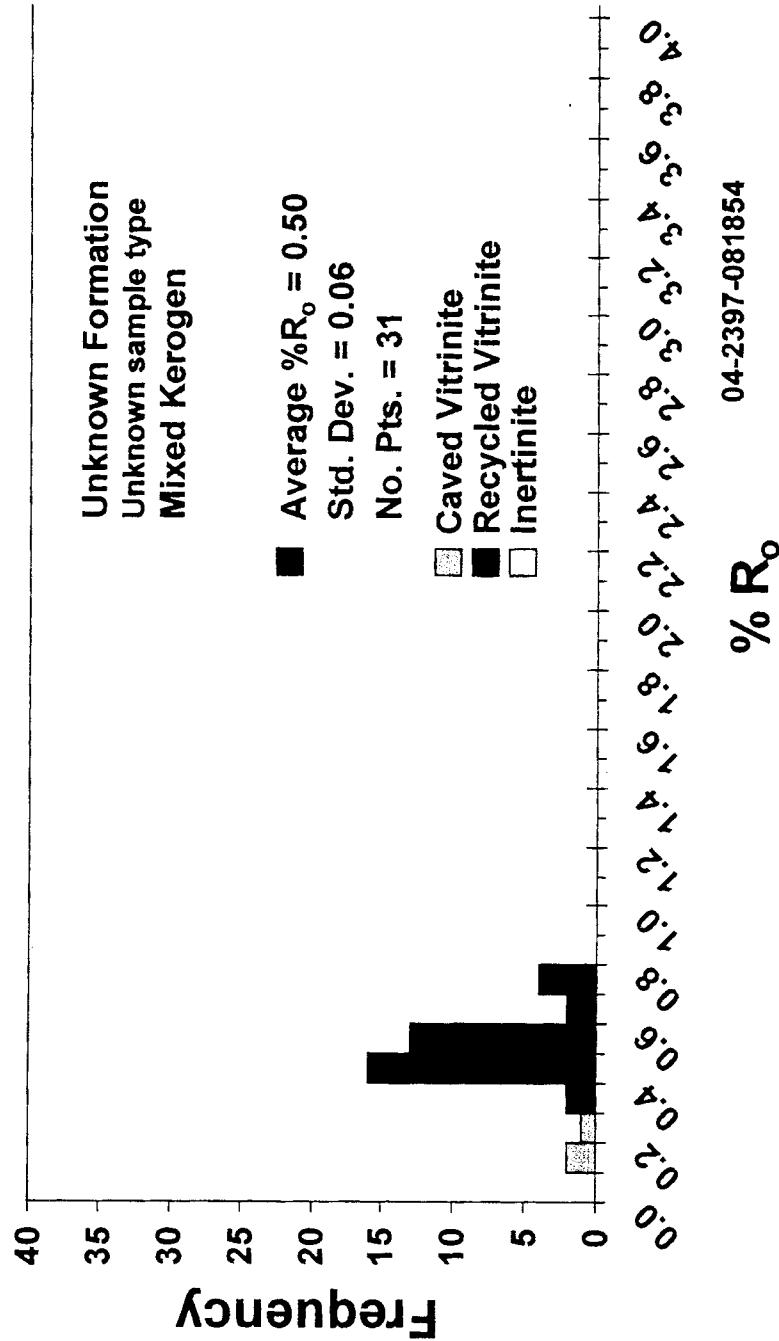
Unknown Sample Source

Sample Id: 322-1



Unknown Sample Source

Sample ID: 322-3



TICORA

Routine Core Analysis Test Results
 Project No: 501088
 May 24, 2004

TerraTek
 University Research Park
 400 West 100 North
 Salt Lake City, Utah 84108

Sample Number	Sample Depth (ft)	Sample Length (in)	Sample Diameter (in)	Ambient Porosity (%)	Dry Bulk Density (g/cc)	Grain Density (g/cc)	Gas Permeability (md)	Saturation		Lithology
								Water (%)	Oil (%)	
1	2152.3	1.951	0.982	42.89	1.49	2.614	2.293	72.86	0.00	micrite, It gy, vfg, intprt, calc, cly
2	2153.6	1.940	0.982	34.47	1.73	2.638	0.722	77.68	0.00	micrite, m-lt gy, vfg, intprt, calc, cly
3	2155.0	1.932	0.981	42.18	1.51	2.607	2.267	81.51	0.00	micrite, It gy, vfg, intprt, calc, cly
4	2112.0	1.934	0.981	20.01	1.83	2.285	52.841	90.38	0.00	sh, gy-blk, silt, carb, of
5	2123.0	1.939	0.986	14.19	1.87	2.174	<0.001	87.33	0.00	sh, dk gy, sly, carb, mol
6	2130.0	1.942	0.982	25.12	1.88	2.513	<0.001	75.27	0.00	micrite, m-lt gy, vfg, intprt, calc, cly
7	2175.5	1.939	0.980	32.56	1.75	2.601	7.395	52.16	0.00	micrite, m-lt gy, vfg, intprt, calc, cly
8	2182.1	1.945	0.980	36.68	1.62	2.562	1.425	47.87	0.00	micrite, It gy, vfg, intprt, calc, cly, mic fos, mol

Description Scheme for Carbonate Sedimentary Rocks:

Rock Type, Color, Grain Size or Crystal Size, Porosity Type, Accessories

Description Scheme for Clastic Sedimentary Rocks:

Rock Type, Color, Grain Size, Cement, Structures and Accessories

Key to Abbreviations:

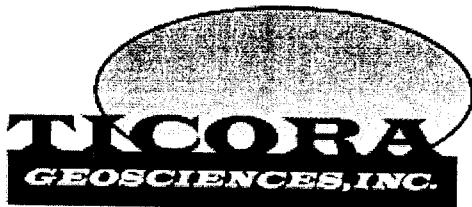
aff	- anhydrite filled fracture	gy	- gray	sid	- siderite
alt	- altered	gyp	- gypsum(iferous)	sil	- silica(eous)
anhy	- anhydrite(ic)	gypff	- gypsum filled fracture	sl/	- slightly
arg	- argillaceous	hem	- hematite(ic)	sltst	- siltstone
bdd	- bedded	if	- incipient fracture	slty	- silty
bent	- bentonite	incl	- inclusion	ss	- sandstone
bf	- buff	intprt	- interparticle	stn	- stain(ed)(ing)
biot	- bioturbated	intx1	- intraparticle	str	- streak
bit	- bitumen	lam	- laminated	styl	- stylolite
bl	- blue(ish)	lav	- lavender	suc	- sucrosic
blk	- black	lig	- lignite(ic)	tan	- tan
bnd	- banded	ls	- limestone	v/	- very
brec	- breccia(ted)	lt	- light	vc	- very coarse
brn	- brown	m	- medium	vf	- very fine
bur	- burrowed	mar	- maroon	vgy	- vuggy
c	- coarse	mas	- massive	wh	- white
calc	- calcite(areous)	mdy	- muddy	wthrd	- weathered
carb	- carbonaceous	mic	- micro	wwy	- wavy
cff	- calcite filled fracture	mica	- micaceous	yel	- yellow
cgl	- conglomerate	mol	- moldic	xl	- crystalline
chky	- chalky	ms	- mudstone		
chlor	- chlorite	mtx	- matrix		
cht	- chert	nod	- nodule(s)		
chty	- cherty	o	- oil		
c1st	- clast	of	- open fracture		
cly	- clay(ey)	ool	- oolitic		
clyst	- claystone	org	- organic		
cob	- cobble	orng	- orange		
dism	- disseminated	pbl	- pebble		
dk	- dark	pel	- peloids		
dff	- dolomite filled	pff	- pyrite filled fracture		
frac	- fracture	pis	- pisolithic		
dol	- dolomite(ic)	pk	- pink		
f	- fine	pof	- partially open fracture		
fen	- fenestral	ppvgs	- pinpoint vugs		
fis	- fissile	ptg	- parting(s)		
flu	- fluorescence	purp	- purple		
fos	- fossil(iferous)	pyr	- pyrite(ic)		
frac	- fracture	qff	- quartz filled fracture		
fri	- friable	qtz	- quartz		
gff	- gouge filled fracture	red	- red		
glauc	- glauconitic	sa	- salty		
gn	- green	sdy	- sandy		
gr	- grain(ed)	sh	- shale		
grnl	- granule	shy	- shaley		

Appendix V

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Residual Moisture, Ash, and Total Sulfur Results

TICORA Geosciences, Inc



SAMPLE ANALYSIS REPORT

Residual Moisture, Volatile Matter, Fixed Carbon,
Sulfur (ASTM D4239C)

Client: Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24

TICORA No.: 322

Report Date:

TICORA Number	Residual Moisture	Ash	Total Sulfur	Ash	Total Sulfur
	wt. %	wt. %	wt. %	wt. %	wt. %
	Air-Dry Basis			Dry Basis	
322-1	3.66	74.54	7.31	77.37	7.59
322-3	3.27	73.45	10.65	75.93	11.01
322-6	2.19	66.78	2.39	68.28	2.44
322-8	2.49	70.01	6.50	71.80	6.67

A handwritten signature in black ink that reads "Christine F. Hoffer".

Laboratory Director



SAMPLE ANALYSIS REPORT

Residual Moisture and Ash (ASTM D5142)

Total Sulfur (ASTM D4239C)

Client Ansbro Petroleum Company, L.L.C.
Well Name: Lowe Ranch 41-24
TICORA No.: 322-1
Report Date: 05/05/04
Analysis Date: 04/01/04

Air-Dry Basis

	Split A	Split B	Split C	Average
Residual Moisture, wt %	3.62	3.53	3.83	3.66
Ash, wt %	74.59	74.71	74.31	74.54

Total Sulfur, wt % 7.310 7.310 7.310 7.310

Dry Basis

	Split A	Split B	Split C	Average
Ash, wt %	77.39	77.44	77.27	77.37

Sulfur, wt % 7.585 7.577 7.601 7.588

A handwritten signature in black ink, appearing to read "Christian F. Hoffer".

Laboratory Director

*Total sulfur experiments conducted by SGS.



SAMPLE ANALYSIS REPORT

Residual Moisture and Ash (ASTM D5142)

Total Sulfur (ASTM D4239C)

Client Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24

TICORA No.: 322-3

Report Date: 05/05/04

Analysis Date: 04/01/04

Air-Dry Basis

	Split A	Split B	Split C	Average
Residual Moisture, wt %	3.27	3.27	3.28	3.27
Ash, wt %	73.52	73.43	73.39	73.45

Total Sulfur, wt % 10.650 10.650 10.650 **10.650**

Dry Basis

	Split A	Split B	Split C	Average
Ash, wt %	76.01	75.91	75.88	75.93

Sulfur, wt % 11.010 11.010 11.011 **11.010**

A handwritten signature in black ink, appearing to read "Christian F. Hoffmann".

Laboratory Director

*Total sulfur experiments conducted by SGS.



SAMPLE ANALYSIS REPORT

Residual Moisture and Ash (ASTM D5142)

Total Sulfur (ASTM D4239C)

Client Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24

TICORA No.: 322-6

Report Date: 05/05/04

Analysis Date: 04/06/04

Air-Dry Basis

	Split A	Split B	Split C	Average
Residual Moisture, wt %	2.25	2.08	2.24	2.19
Ash, wt %	66.46	67.36	66.52	66.78

Total Sulfur, wt % 2.390 2.390 2.390 **2.390**

Dry Basis

	Split A	Split B	Split C	Average
Ash, wt %	67.99	68.79	68.04	68.28

Sulfur, wt % 2.445 2.441 2.445 **2.444**

A handwritten signature in black ink, appearing to read "Christine F. Hoffer".

Laboratory Director

*Total sulfur experiments conducted by SGS.



SAMPLE ANALYSIS REPORT

Residual Moisture and Ash (ASTM D5142)

Total Sulfur (ASTM D4239C)

Client Ansbro Petroleum Company, L.L.C.

Well Name: Lowe Ranch 41-24

TICORA No.: 322-8

Report Date: 05/05/04

Analysis Date: 04/01/04

Air-Dry Basis

	Split A	Split B	Split C	Average
Residual Moisture, wt %	2.50	2.44	2.54	2.49
Ash, wt %	70.00	70.03	70.01	70.01

Total Sulfur, wt % 6.500 6.500 6.500 6.500

Dry Basis

	Split A	Split B	Split C	Average
Ash, wt %	71.79	71.78	71.83	71.80

Sulfur, wt % 6.667 6.663 6.669 6.666

A handwritten signature in black ink, appearing to read "Christine F. Haffner".

Laboratory Director

*Total sulfur experiments conducted by SGS.

Appendix VI

Ansbro Petroleum Company, L.L.C.
Lowe Ranch 41-24
Pierre Shale

Gas Composition

TICORA Geosciences, Inc



TICORA ID : 322-1-1
Corrupt/Irregular Sample

OPERATOR : Ansbro Petroleum
FIELD : Wildcat
WELL : Lowe Ranch 41-24
STATE : Nebraska
COUNTY : Grant
DATE/TIME SAMPLED : 3/17/04 @ 7:30
CAN ID# : 3-111

DATE ANALYZED : 3/17/2004
SAMPLE CYLINDER ID# : T-39
GC Technician: RCH

Gas	Measured Mole Fraction	Air Free Mole Fraction	Measured Normalized, %	Air Free Normalized, %
H2	0.0000	0.0000	0.00	0.00
O2	0.0057	0.0000	0.83	0.00
N2	0.4203	0.3988	60.73	59.99
CO	0.0000	0.0000	0.00	0.00
CO2	0.0097	0.0097	1.40	1.46
C1	0.2449	0.2449	35.39	36.84
C2	0.0083	0.0083	1.20	1.25
C3	0.0023	0.0023	0.34	0.35
iC4	0.0002	0.0002	0.03	0.04
nC4	0.0004	0.0004	0.05	0.05
iC5	0.0001	0.0001	0.01	0.01
nC5	0.0001	0.0001	0.01	0.01
C6	0.0000	0.0000	0.00	0.00
Total	0.6920	0.6648	100.00	100.00

Relative Density, Calculated
60°F and 1 atm 0.8274

Total Calorific Value (Btu/Cubic ft), Calculated
Dry 407.9
Saturated 400.8

Total Hydrocarbons, Measured
Air Free (%) 38.55

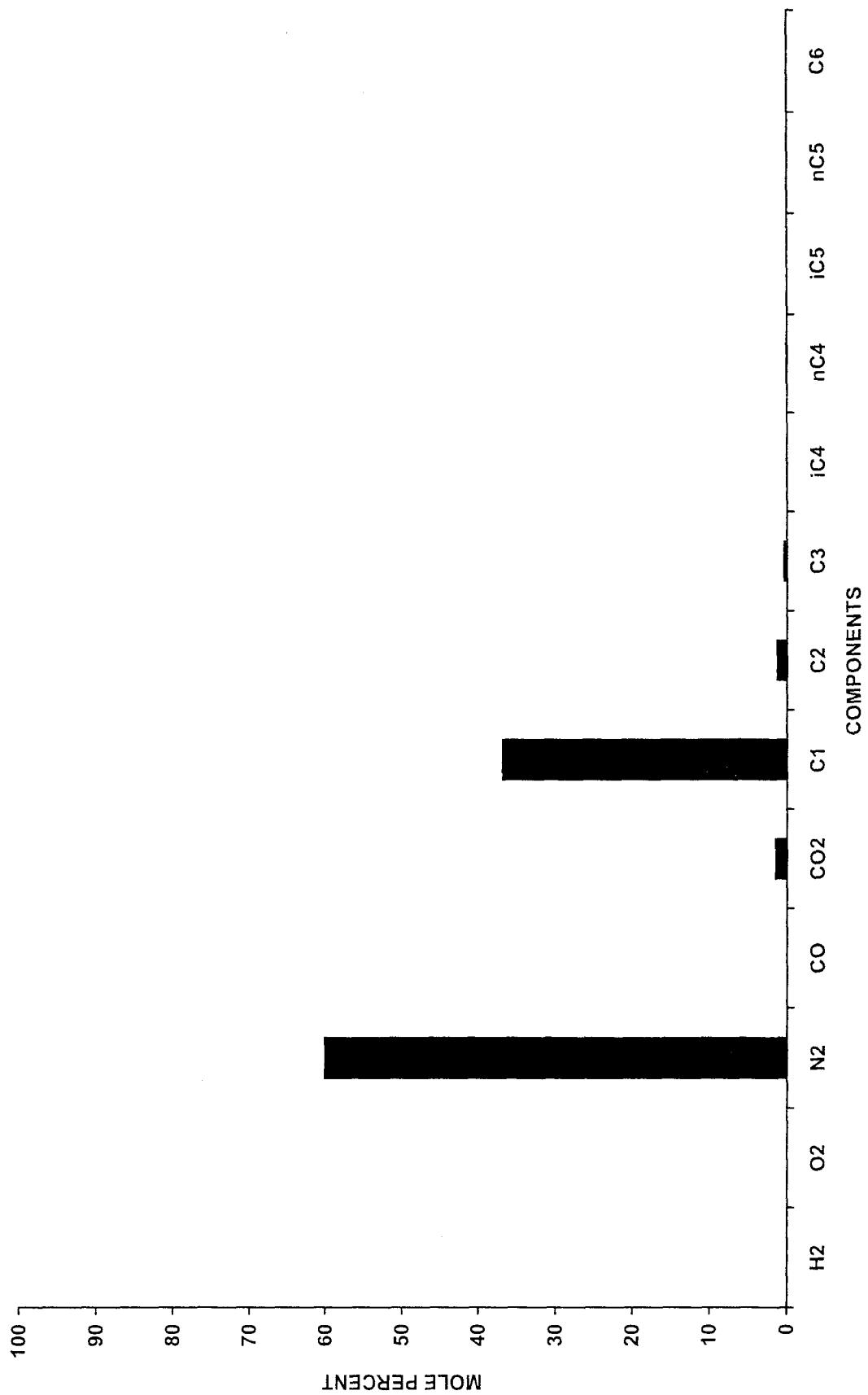
Relative Molecular Mass 16.71

Laboratory Manager

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Arvada, Colorado 80007

Phone (720) 898-8200
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TICORA GEOSCIENCES, INC
Lowe Ranch 41-24
CAN 3-111 3/17/04 @ 7:30



TICORA Geosciences, Inc



TICORA ID : 322-8-1
Corrupt/Irregular Sample

OPERATOR : Ansbro Petroleum
FIELD : Wildcat
WELL : Lowe Ranch 41-24
STATE : Nebraska
COUNTY : Grant
DATE/TIME SAMPLED : 3/12/04 @ 21:24
CAN ID# : 3-72

DATE ANALYZED : 3/16/2004
SAMPLE CYLINDER ID# : GT-114
GC Technician: RCH

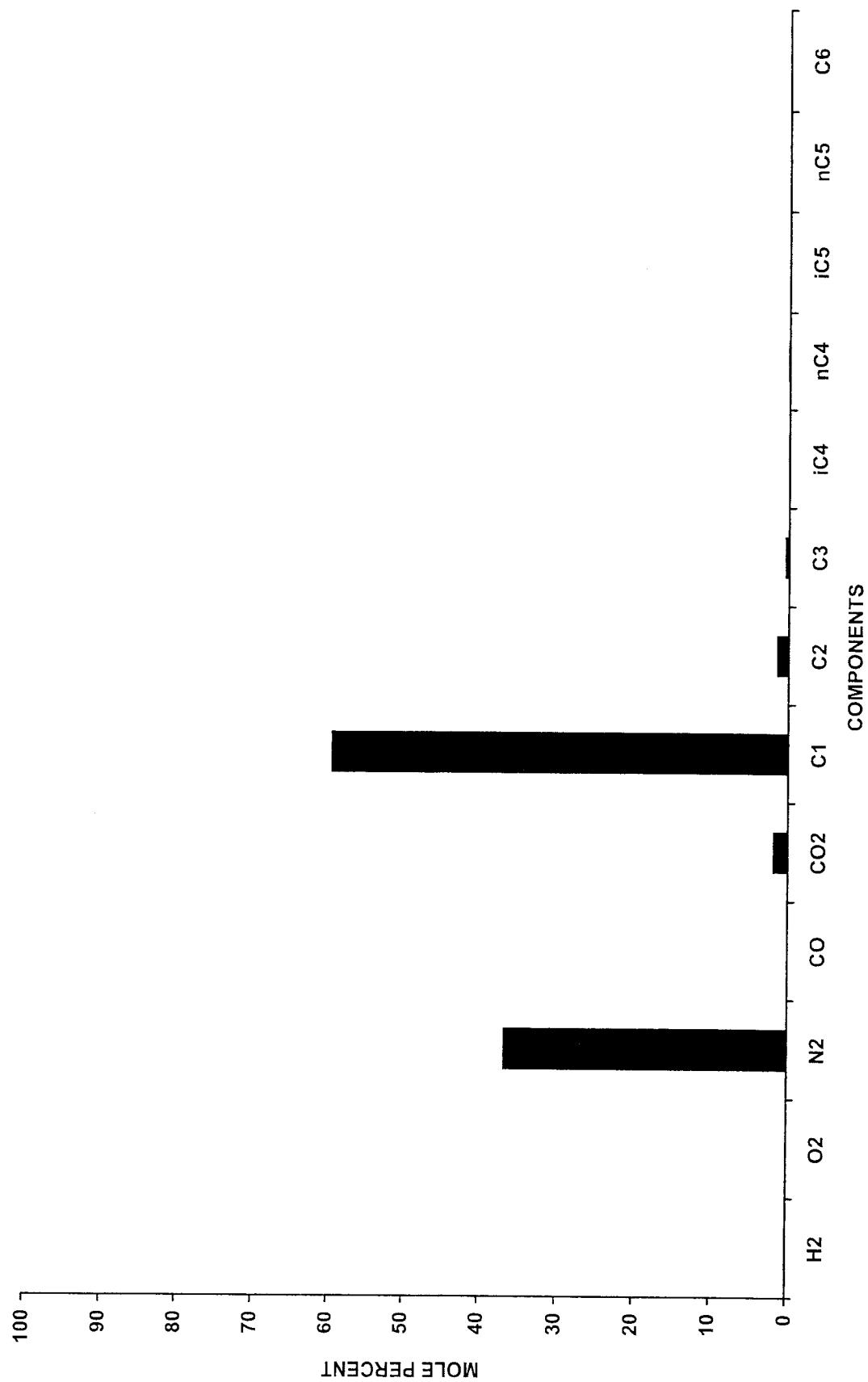
Gas	Measured Mole Fraction	Air Free Mole Fraction	Measured Normalized, %	Air Free Normalized, %	Relative Density, Calculated 60°F and 1 atm	0.7366
H2	0.0001	0.0001	0.02	0.04	Total Calorific Value (Btu/Cubic ft), Calculated	
O2	0.0538	0.0000	7.99	0.00	Dry	642.8
N2	0.3547	0.1539	52.62	36.70	Saturated	631.6
CO	0.0000	0.0000	0.00	0.00	Total Hydrocarbons, Measured	
CO2	0.0077	0.0077	1.14	1.83	Air Free (%)	61.43
C1	0.2494	0.2494	37.00	59.46	Relative Molecular Mass	16.29
C2	0.0060	0.0060	0.89	1.43		
C3	0.0018	0.0018	0.26	0.42		
iC4	0.0002	0.0002	0.02	0.04		
nC4	0.0003	0.0003	0.04	0.07		
iC5	0.0000	0.0000	0.01	0.01		
nC5	0.0000	0.0000	0.01	0.01		
C6	0.0000	0.0000	0.00	0.00		
Total	0.6740	0.4194	100.00	100.00		

Laboratory Manager

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TICORA GEOSCIENCES, INC
Lowe Ranch 41-24
CAN 3-72 3/12/04 @ 21:24



TICORA Geosciences, Inc



TICORA ID : 322-6-1
Corrupt/Irregular Sample

OPERATOR : Ansbro Petroleum
FIELD : Wildcat
WELL : Lowe Ranch 41-24
STATE : Nebraska
COUNTY : Grant
DATE/TIME SAMPLED : 3/13/04 @ 00:08
CAN ID# : 3-32

DATE ANALYZED : 3/16/2004
SAMPLE CYLINDER ID# : GT-85
GC Technician: RCH

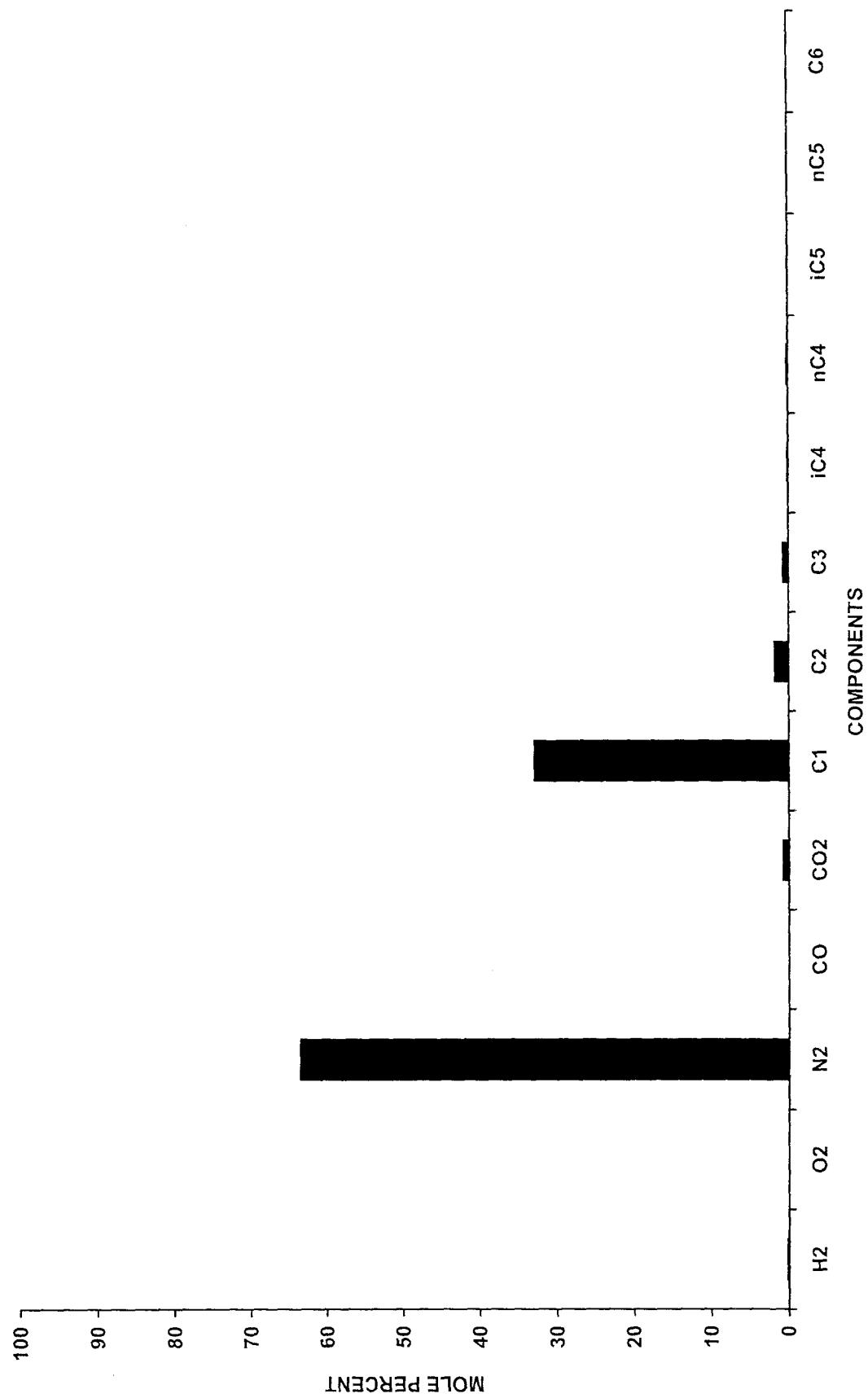
Gas	Measured Mole Fraction	Air Free Mole Fraction	Measured Normalized, %	Air Free Normalized, %	Relative Density, Calculated 60°F and 1 atm	0.8419
H2	0.0009	0.0009	0.12	0.17	Total Calorific Value (Btu/Cubic ft), Calculated	
O2	0.0421	0.0000	5.66	0.00	Dry	390.2
N2	0.5031	0.3461	67.62	63.51	Saturated	383.4
CO	0.0000	0.0000	0.00	0.00	Total Hydrocarbons, Measured	
CO2	0.0041	0.0041	0.55	0.75	Air Free (%)	35.57
C1	0.1791	0.1791	24.07	32.87	Relative Molecular Mass	19.03
C2	0.0098	0.0098	1.31	1.79		
C3	0.0038	0.0038	0.51	0.69		
iC4	0.0004	0.0004	0.05	0.07		
nC4	0.0006	0.0006	0.08	0.11		
iC5	0.0001	0.0001	0.01	0.02		
nC5	0.0001	0.0001	0.01	0.02		
C6	0.0000	0.0000	0.00	0.00		
Total	0.7440	0.5449	100.00	100.00		

Laboratory Manager

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TICORA GEOSCIENCES, INC
Lowe Ranch 41-24
CAN 3-32 3/13/04 @ 00:08





TICORA ID : 322-1-2
Possible Corruption
Sample is Suspect

OPERATOR : Ansbro Petroleum
FIELD : Wildcat
WELL : Lowe Ranch 41-24
STATE : Nebraska
COUNTY : Grant
DATE/TIME SAMPLED : 3/31/04 @ 12:43
CAN ID# : 3-111

DATE ANALYZED : 4/5/2004
SAMPLE CYLINDER ID# : GT-63
GC Technician: MRW

Gas	Measured Mole Fraction	Air Free Mole Fraction	Measured Normalized, %	Air Free Normalized, %	Relative Density, Calculated 60°F and 1 atm	0.7484
H2	0.0000	0.0000	0.00	0.00		
O2	0.0972	0.0000	13.39	0.00		
N2	0.4628	0.1003	63.76	37.68		
CO	0.0000	0.0000	0.00	0.00		
CO2	0.0048	0.0048	0.66	1.80		
C1	0.1524	0.1524	21.00	57.28		
C2	0.0064	0.0064	0.88	2.41		
C3	0.0017	0.0017	0.24	0.65		
iC4	0.0002	0.0002	0.02	0.07		
nC4	0.0002	0.0002	0.03	0.08		
iC5	0.0000	0.0000	0.01	0.02		
nC5	0.0000	0.0000	0.01	0.01		
C6	0.0000	0.0000	0.00	0.00		
Total	0.7259	0.2661	100.00	100.00		

Total Calorific Value (Btu/Cubic ft), Calculated
Dry 645.8

Saturated 634.6

Total Hydrocarbons, Measured
Air Free (%) 60.52

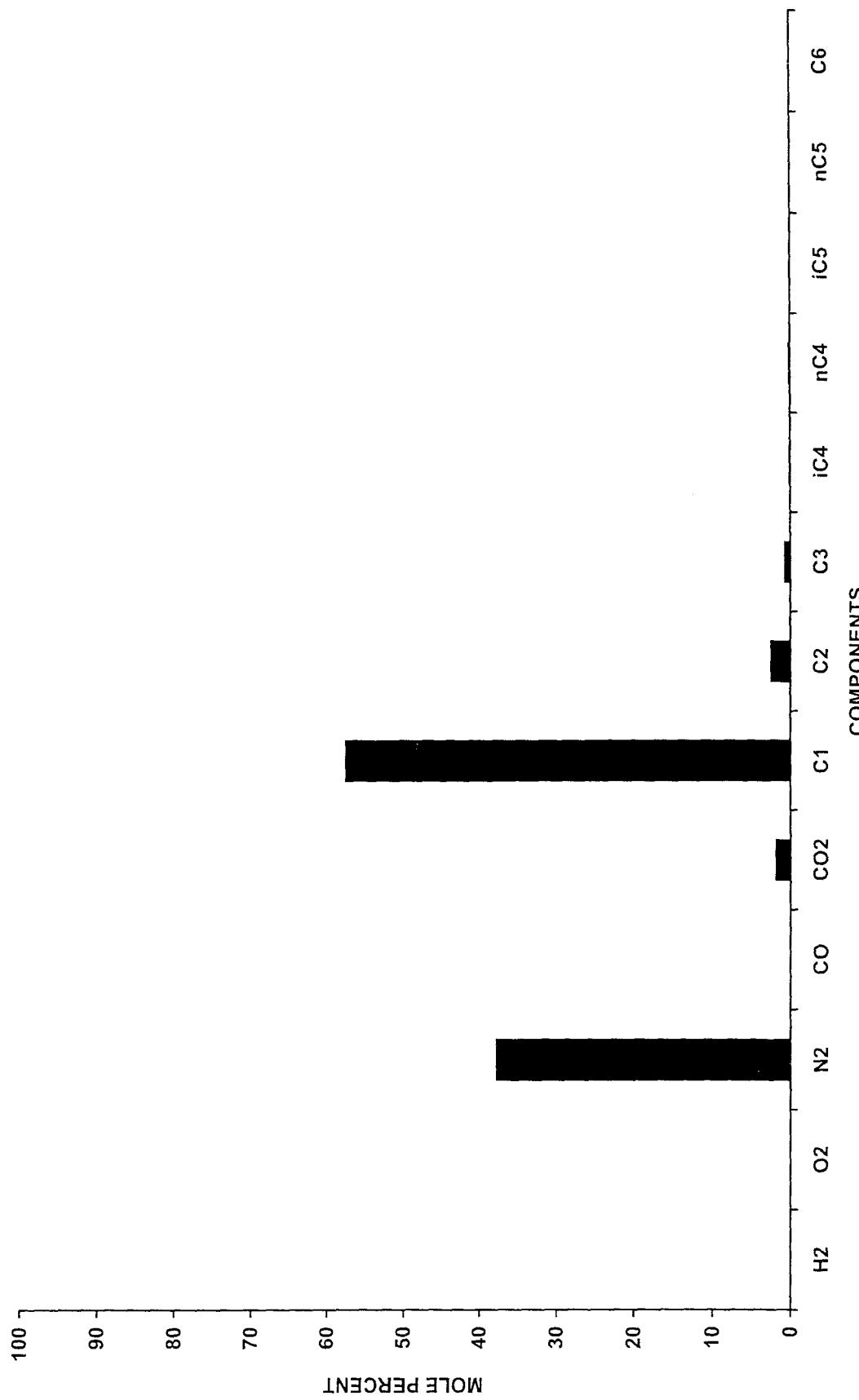
Relative Molecular Mass 19.03

Laboratory Manager

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TICORA GEOSCIENCES, INC
Lowe Ranch 41-24
CAN 3-111 3/31/04 @ 12:43



TICORA Geosciences, Inc



TICORA ID : 322-8-2

OPERATOR : Ansbro Petroleum
FIELD : Wildcat
WELL : Lowe Ranch 41-24
STATE : Nebraska
COUNTY : Grant
DATE/TIME SAMPLED : 3/17/04 @ 7:41
CAN ID# : 3-72

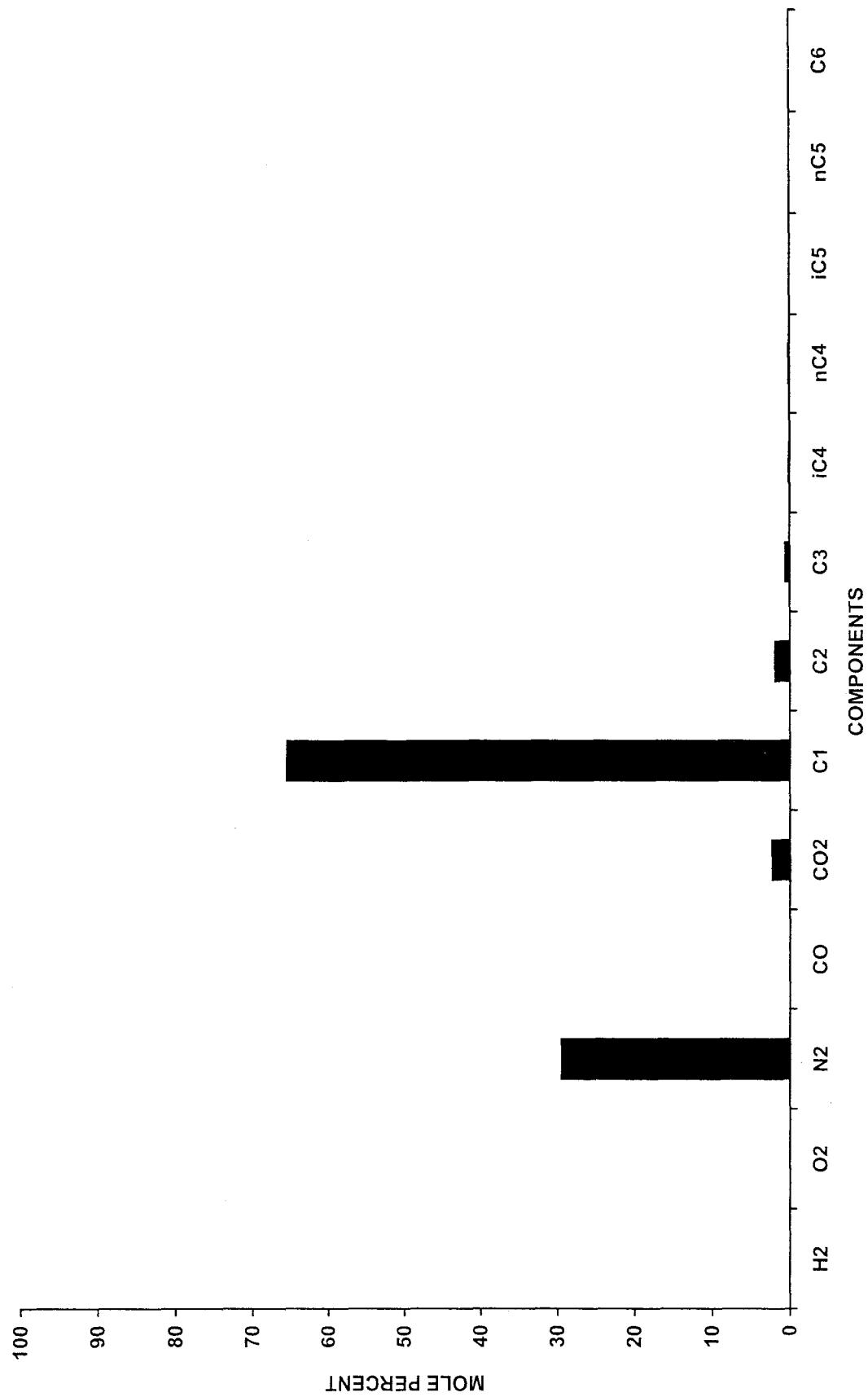
DATE ANALYZED : 3/17/2004
SAMPLE CYLINDER ID# : GT-35
GC Technician: RCH

Gas	Measured	Air Free			Relative Density, Calculated 60°F and 1 atm	0.7163
	Mole Fraction	Mole Fraction	Measured Normalized, %	Air Free Normalized, %		
H2	0.0001	0.0001	0.01	0.01		
O2	0.0026	0.0000	0.42	0.00		
N2	0.1883	0.1788	30.45	29.48		
CO	0.0000	0.0000	0.00	0.00		
CO2	0.0140	0.0140	2.27	2.31		
C1	0.3973	0.3973	64.24	65.53		
C2	0.0115	0.0115	1.87	1.90		
C3	0.0035	0.0035	0.57	0.58		
iC4	0.0003	0.0003	0.05	0.06		
nC4	0.0006	0.0006	0.09	0.09		
iC5	0.0001	0.0001	0.02	0.02		
nC5	0.0001	0.0001	0.01	0.02		
C6	0.0000	0.0000	0.00	0.00		
Total	0.6185	0.6063	100.00	100.00		

Laboratory Manager

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TICORA GEOSCIENCES, INC
Lowe Ranch 41-24
CAN 3-72 3/17/04 @ 7:41



TICORA Geosciences, Inc